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Migratory Timing and Abundance Estimates for Sockeye Salmon in Upper Cook Inlet, Alaska, 2015

by

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and

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December 2016

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$log_{2,}$ etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

In 2015, the southern offshore test fishery (OTF) was conducted from July 1 through July 30 and captured 2,378 sockeye salmon *Oncorhynchus nerka* representing 1,609 catch per unit of effort (CPUE) index points. The midpoint of the 2015 sockeye salmon run at the southern OTF occurred on 25 July. A formal inseason estimate of the 2015 run size was made on July 27; this analysis predicted a total run to Upper Cook Inlet (UCI) of 5.9 million sockeye salmon. The best-fit total run estimate deviated from the estimated total run of 6.30 million fish by 6.5%. An inseason estimate was also made for the Kenai River sockeye salmon run on July 27; the July 27 analysis predicted a total run to the Kenai River ranging between 2.20 and 3.53 million fish. The best-fit Kenai River total run estimate from this analysis (3.53 million fish) differed from the estimated total run of 3.89 million fish by 9.3%. A mixed stock analysis using genetic data (MSA) was performed on samples collected during the test fishery, which showed similar stock compositions to previous years. The MSA sampling for the OTF project was included all coho salmon *O. kisutch* captured to estimate spatial and temporal stock compositions of the harvest.

Key words: Pacific salmon, *Oncorhynchus* spp., Upper Cook Inlet, Alaska, test fishery, migratory behavior, mixed stock analysis, MSA.

INTRODUCTION

In 1979, the Alaska Department of Fish and Game (ADF&G) began an offshore test fishery (OTF) project (hereafter referred to as the southern OTF) near the southern boundary of the Upper Cook Inlet (UCI) salmon management area between Anchor Point and the Red River Delta (Figure 1). The project was designed to estimate the total sockeye salmon *Oncorhynchus nerka* run (including run timing) returning to UCI during the commercial salmon fishing season. These data are used to help adjust commercial fishing times and areas to most efficiently harvest surplus sockeye salmon or restrict fisheries that may overharvest specific stocks. In recent years, the Alaska Board of Fisheries (BOF) has assembled management plans requiring inseason abundance estimates of the annual sockeye salmon run to implement specific plan provisions. The southern OTF project has increasingly become one of the most important tools Upper Cook Inlet fishery managers utilize to make inseason fishery management decisions that comply with BOF management directives.

Test fishery results have been reported annually since 1979 (Waltemyer 1983a, 1983b, 1986a, 1986b; Hilsinger and Waltemyer 1987; Hilsinger 1988; Tarbox and Waltemyer 1989; Tarbox 1990–1991, 1994–1998a, 1998b, 1999; Tarbox and King 1992; Shields 2000, 2001, 2003; Shields and Willette 2004, 2005, 2007, 2008, 2009a, 2009b, 2010, 2011; Shields et al. 2013; Dupuis and Willette 2014; Dupuis et al. 2015, 2016).

In 2012, a second test fishery project (hereafter referred to as the northern OTF) was added. This project collected tissue samples from sockeye salmon for genetic stock identification in order to assess the spatial and temporal separation of Susitna River sockeye salmon as they migrate through Cook Inlet. From 2012 to 2013, the northern OTF vessel fished 7 stations along a single transect; in 2014, the vessel fished 8 stations along 2 transects running from Kalifornsky Beach to the northern tip of Kalgin Island (Stations 2–5) and from the southern tip of Kalgin Island to Clam Gulch Beach (Stations 8–11; Figure 2). The modification to the northern OTF was made because it was believed that, due to the lack of fish encountered at the omitted stations (Dupuis et al. 2015), ADF&G could more efficiently gather spatial and temporal information by adding the second transect. The northern OTF project was discontinued prior to the 2015 season due to a lack of funding. This report presents the results of the 2015 southern offshore test fishing project and historic genetic stock identification information collected from both the northern and southern test fisheries.

OBJECTIVES

The objectives of the southern OTF project were as follows:

1. Develop an inseason estimate of the 2015 UCI sockeye salmon total run;
2. Develop an inseason estimate for the 2015 Kenai River sockeye salmon total run; and
3. Estimate the spatial and temporal distribution of various sockeye salmon and coho *O. kisutch* salmon stocks entering UCI.

METHODS

TEST FISHING

The southern OTF sampled salmon returning to UCI by fishing 6 geographically fixed stations, which were numbered consecutively from east to west (Figure 1). The current southern OTF stations have been fished since 1992 (Tarbox 1994) and provide the most reliable estimates of inseason run size and timing. Station 6.5 was not fished prior to 1992; analyses concluded that the addition of Station 6.5 increased sampling power but did not alter estimates of run timing (Tarbox and King 1992). The drift gillnet vessels *F/V Wonder Worker* and *F/V Ryan J* sampled all 6 stations of the southern OTF transect daily, traveling east to west on odd-numbered days and west to east on even-numbered days. Sampling began on July 1 and the project concluded on July 30. Catch and catch per unit effort (CPUE) data for missed stations were interpolated using a simple linear regression between catches from the day before and the day after for each station not fished.

The following physical and chemical measurements were taken at the start of each gillnet set at each station: air temperature, water temperature and salinity (at 1 m below the surface), wind velocity and direction, tide stage, water depth, and water clarity. Air and water temperatures (°C) and salinity (ppt) were measured using a YSI[1] Model Pro30 conductivity/salinity/temperature meter (YSI Inc.; Yellow Springs, OH). Wind speed was measured in knots and direction was recorded as 0 (no wind), 1 (north), 2 (northeast), 3 (east), 4 (southeast), 5 (south), 6 (southwest), 7 (west), or 8 (northwest) using a pocket weather tracker. Tide stage was classified as 1 (high slack), 2 (low slack), 3 (flooding), or 4 (ebbing) by observing the movement of the vessel while drifting with the gill net. Water depth was measured in fathoms (fm) using an echo sounder and water clarity was measured in meters (m) using a 17.5 cm secchi disk, following methods described by Koenings et al. (1987).

A conductivity-temperature-depth profiler (CTD) was also deployed at each station each day along the southern OTF transect. The CTD measured temperature (°C), salinity (psu; psu is defined as practical salinity unit and is equivalent to ppt), chlorophyll *a* (mg/m^3), oxygen (percent saturation) and phytosynthetically active radiation (PAR, percent surface maximum) throughout the water column. The CTD was lowered to within about 3 m of the bottom and retrieved at 1 m/sec. In this report, a cross-section of monthly mean parameter distributions along the southern OTF transect are presented.

The southern OTF vessel fished 366 m (1,200 ft or 200 fathoms) of multi-filament drift gillnet with a mesh size of 13 cm (5 1/8 inches). The net was 45 meshes deep and constructed of double

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[1] Product names used in this report are included for scientific completeness but do not constitute a product endorsement.

knot Super Crystal shade number 1, with filament size 53/S6F. At each station, all salmon captured in the drift gillnet were identified by species and enumerated. Sockeye salmon captured at the southern OTF ($n \leq 50$ at each station) were measured for length (mid-eye to tail fork) to the nearest mm.

For each species of salmon, the number of fish captured at each station (*s*) on each fishing day (*i*) was expressed as a CPUE statistic, or index point, and standardized to the number of fish caught in 100 fathoms of gear in 1 hour of fishing time:

$$CPUE_{s,i} = \frac{100\,fm \;\; \times \;\; 60\,\text{min} \;\; \times \;\; number\ of\ fish}{fm\ of\ gear \;\; \times \;\; MFT} \;. \tag{1}$$

Mean fishing time (*MFT*) was:

$$MFT = (C - B) + \frac{(\mathrm{B} - \mathrm{A}) + (\mathrm{D} - \mathrm{C})}{2} \;, \tag{2}$$

where: A = time net deployment started,

B = time net fully deployed,

C = time net retrieval started, and

D = time net fully retrieved.

Once deployed at a station, the drift gillnets fished 30 minutes before retrieval was started. However, the net was capable of capturing fish prior to being fully deployed, because it was during the time it was being retrieved. *MFT* was therefore adjusted by summing the total time it took to set and retrieve the net, then dividing this time in half, and adding it to the time when the entire net was deployed and fished (Equation 2).

Daily $CPUE_i$ data were summed for all stations (*m*) (typically 6) as follows:

$$CPUE_i = \sum_{s=1}^{m} CPUE_{s,i} \;. \tag{3}$$

Cumulative $CPUE_i$ ($CCPUE_d$) was given by:

$$CCPUE_d = \sum_{i=1}^{d} CPUE_i \;, \tag{4}$$

where day (*d*) is date of the estimate.

Genetic Stock Identification Sampling

Tissue Sampling

Sockeye salmon captured at each station on the southern OTF ($n \leq 50$) had the left axillary process removed for genetic analysis (Habicht et al. 2007). Additionally, in 2015, all coho salmon captured had the left axillary process removed for future genetic analysis. Once removed, the axillary process from individual fish was then placed in ethanol in a single well in a 48 deep-well plate. For data continuity, sockeye salmon tissue samples from the southern OTF were paired with corresponding length information. These data were collated and archived by division staff at the ADF&G office in Soldotna.

DESCRIBING THE SALMON MIGRATION AND PROJECTING TOTAL RUN

For the southern OTF, the sockeye salmon run was described for each of the previous years based on the respective test fishing data, as described in Mundy (1979):

$$Y_{yr,d} = 1 \big/ \left(1 + e^{-(\mathrm{a}+\mathrm{bd})}\right) \; , \tag{5}$$

Where $Y_{yr,d}$ is modeled cumulative proportion of $CCPUE_{yr,f}$ (f is final day of season) for year (yr) as of day (d), and a and b are model parameters.

Variables without the subscript *yr* refer to the current year's estimate. To determine which of the previous run timing curves most closely fit the current year's data on day d, and to estimate total run for the entire season (TR_f), a projection of the current year's $CCPUE_d$ at the end of the season (*CCPUEF*) was estimated as per Mundy (1979):

$$CCPUEF = \frac{\sum_{d=0}^{D} CCPUE_d^{\;2}}{\sum_{d=0}^{D} Y_{yr,d} \cdot CCPUE_d} \; . \tag{6}$$

This model assumes that the modeled cumulative proportions ($Y_{yr,d}$) for previous year (yr) are the same as for the current year (Mundy 1979). To test this assumption, inseason Y_d was estimated as:

$$Y_d = \frac{CCPUE_d}{CCPUEF} \; , \tag{7}$$

and mean squared error (*MSE*) between Y_d and $Y_{yr,d}$ was estimated as:

$$MSE = \frac{\sum_{d=0}^{D} \left(Y_{yr,d} - Y_d\right)^2}{D+1} . \tag{8}$$

Years were ranked from lowest *MSE* (best model) to highest (worst), and the best fit years were used to estimate *CCPUEF* for the current year. Catchability, or the fraction of the available population taken by a defined unit of fishing effort, was estimated as:

$$q_d = \frac{CCPUE_d}{r_d} \tag{9}$$

where q_d is the estimated cumulative catchability as of day (d), and r_d is the cumulative total run as of day (d).

The cumulative total run on day (d) was the sum of all estimates for commercial, recreational, and personal use harvests to date, total escapement to date, and the number of residual (i.e., residing) sockeye salmon in the district. The commercial harvest was estimated inseason from mandatory catch reports called or faxed into the ADF&G office. Personal use and recreational harvests were estimated inseason by examining catch statistics from previous years' fisheries on similar sized runs. Total passage to date included estimated passage into all monitored systems (Susitna, Kenai, and Kasilof rivers, and Fish Creek) and unmonitored systems, which are assumed to be 15% of the passage into monitored systems (Tobias and Willette 2003). The number of residual fish in the district was estimated by assuming exploitation rates of 70% in setnet fisheries, 35–40% in districtwide driftnet fisheries (based on the number of boats that fished), and 25% in reduced district driftnet fisheries (Mundy et al. 1993). For example, if the drift gillnet fleet harvested 500,000 sockeye salmon on an inletwide fishing period, the number of sockeye salmon originally in the district would be 1,250,000 (500,000/0.40 = 1,250,000) where the number remaining, or the residual, is 750,000 (1,250,000–500,000 = 750,000).

Passage rate (PR_d), as of day (d), is the expansion factor used to convert CPUE into estimated numbers of salmon passing the test fishing transect line into UCI, and was:

$$PR_d = 1/q_d \; . \tag{10}$$

Total run at the end of the season (TR_f) was:

$$TR_f = PR_d \cdot CCPUEF. \tag{11}$$

The midpoint of the run (M), defined as the day that approximately 50% of the total run has passed the southern OTF transect from day 1 (June 24), was:

$$M = -a/b\,, \tag{12}$$

where a and b are model parameters.

The last day of test fishing typically occurs on 30 July each year, which means the “tail-end” of the sockeye salmon run is not assessed by the project. In 2015, the southern OTF project ended on 30 July, but escapement monitoring continued through 14 August in the Kasilof River, 26 August in the Kenai River, 20 September at Fish Creek, and into late August at Judd, Chelatna, and Larson lakes. In addition, commercial fishing also continued into September.

Because the test fishery does not encompass the entire sockeye salmon run, the total $CCPUEF$ for the test fishery is estimated postseason using 2 methods (Equations 13 and 14):

$$CCPUE_f^h = CCPUEF \cdot \frac{H_t}{H_L}\;, \tag{13}$$

where $CCPUE_f^h$ is the total estimated $CCPUEF$ for the season, based on harvest,

H_t = total commercial harvest for the season,

H_L = total commercial harvest through final day of test fishery (f+2), and

L = number of days (lag time) it took salmon to travel from test fishery to commercial harvest areas (2 days, Mundy et al. 1993):

$$CCPUE_t^r = CCPUEF \cdot \frac{E_t + H_t}{E_L + H_L}\,, \tag{14}$$

Where $CCPUE_t^r$ is the total estimated $CCPUEF$ for the season, based upon total run,

E_t = total escapement for the season,

H_t = total commercial harvest for the season,

E_L = total UCI escapement through the final day of the test fishery, summed from 6 different streams,

H_L = total UCI commercial harvest through the final day of the test fishery, and

L = number of days (lag time) it took salmon to travel from the test fishery to spawning streams or commercial harvest areas.

The total run adjustment to *CCPUEF* (Equation 14) has replaced adjustments based on harvest alone (Equation 13), primarily due to changes to commercial fishing management plans made by the Alaska Board of Fisheries. Management plans now provide less fishing time in August than in the past; therefore, adjustments based on harvest alone would not have accurately reflected the additional fish that entered the district after the test fishery ceased. The total run to date on the last day of the test fishery was the sum of all commercial harvest data and escapement. Escapement estimates were derived by summing passage from 2 sockeye salmon sonar enumeration sites (Kenai and Kasilof rivers) and adding to that an expansion of the cumulative weir counts at Chelatna, Judd, and Larson lakes to reflect the total Susitna River sockeye salmon escapement, plus the weir count at Fish Creek, and an estimate of escapement to all unmonitored systems through day (d). Total Susitna River sockeye escapement (E_S) was estimated by expanding the sum of weir counts at Chelatna (E_C) and Judd (E_J) lakes by a factor of 2.3 and the Larson lake weir count (E_L) by a factor of 1.9, i.e.,

$$E_S = ((E_C + E_J) \cdot 2.3) + (E_L \cdot 1.9) \tag{15}$$

The expansion factor for Chelatna and Judd lakes was estimated from mark–recapture studies conducted in 2007–2012 (Yanusz et al. 2007, 2011a, 2011b; Willette et al. 2016) and the expansion factor for Larson Lake was estimated from mark–recapture studies conducted in 2006–2008 (Yanusz et al. 2007, 2011a, 2011b).

An estimate of escapement to all non-monitored systems in UCI is considered to be 15% of the monitored runs (Tobias and Willette 2003). Lag times are the approximate time for fish to migrate from the test fishery transect to a particular destination. As suggested by Mundy et al. (1993), lag times must be considered when estimating the total run passing the test fishery transect on day (d). A lag time of up to 2 days was assumed for fish harvested in the commercial fishery. We estimated lag times between the test fishery and escapement projects as follows: Kasilof and Kenai rivers, 4 days; Fish Creek, 7 days (Mundy et al. 1993); and Susitna River weirs, 14 days. The number of sockeye salmon harvested in sport and personal use fisheries after test fishing has ceased that have not been estimated in the escapement are assumed to be insignificant, and therefore are not utilized in the *CCPUEF* post-test-fishery adjustment.

Adjusted estimates of *CCPUEF* ($CCPUE_t^h$ and $CCPUE_t^r$) were used for postseason estimates of TR_f.

PROJECTING THE KENAI RIVER TOTAL RUN

In addition to making inseason estimates of the total size of the annual sockeye salmon run, UCI commercial fishery management plans require ADF&G to make an inseason estimate of the number of Kenai River sockeye salmon in the run. Various management actions in both sport and commercial fisheries are tied to the total abundance of Kenai River sockeye salmon, which is characterized by 3 different size ranges: less than 2.3 million fish, between 2.3 and 4.6 million fish, and greater than 4.6 million fish (Shields and Dupuis 2012). As previously described, the

CCPUED curves from the top 5 best fits of previous year's test fishery data were used to project the *CCPUEF* for 2015, which was then used to estimate the UCI total run. The Kenai River component of the run was determined in part from a weighted age-composition allocation method to estimate the stock composition of the commercial harvest (Tobias and Tarbox 1999). This method (Bernard 1983) allocates the commercial harvest to various stocks by comparing the age composition of the escapement in the major river systems of UCI to the age composition of sockeye salmon harvested commercially (Tobias and Willette 2004). Three important assumptions of the weighted age-composition method are that: 1) the age compositions of fish escaping into the various river systems are representative of the age composition in the commercial harvest; 2) the commercial harvest in specific areas is composed of nearby stocks; and 3) exploitation rates are equal among stocks within age classes. The Kenai River run to date (TRK_d) was estimated by summing: 1) the commercial harvest of Kenai River stocks; 2) the estimated passage of sockeye salmon in the Kenai River (using dual-identification sonar (DIDSON); and 3) an estimate of sport and personal use harvest below the river mile 19 sonar site. Finally, the remainder of the run that will be Kenai River origin was projected by subtracting the run to date from the total run estimate, and then applying an estimate of the proportion of the run remaining that will be Kenai River (PK_d) by reviewing previous years' data for runs of similar timing. The total Kenai River run (TRK_f) was estimated from:

$$TRK_f = ((TR_f - r_d) \cdot PK_d) + TRK_d \tag{16}$$

RESULTS AND DISCUSSION

TEST FISHING

In 2015, the southern OTF boat fished 157 of the possible 180 gillnet sets (i.e., 6 possible sets per day for 30 days; Table 1). A total of 2,378 sockeye salmon were captured during the 2015 test fishery, as well as 129 pink salmon *O. gorbuscha*, 1,091 chum salmon *O. keta*, 411 coho salmon *O. kisutch*, and 7 Chinook salmon *O. tshawytscha* (Tables 1–3; Appendices A1–A13). Sockeye salmon daily catches ranged from 1 fish on 1 July to 602 fish on 22 July. The sockeye salmon *CCPUEF* for the 2015 project was 1,609, with daily CPUE values ranging from 1 to 342 (Table 1). Linear regression of historic data showed that the 1992–2015 annual test fishery unadjusted *CCPUEF* and the total annual run of sockeye salmon to UCI (Figure 3) were significantly (α = 0.05) correlated (P = 0.02 and r^2 = 0.20), and 80% of the variation unexplained. Because so much of the variation remains unexplained, the southern OTF *CCPUEF* by itself may not be a reliable predictor of the total annual sockeye salmon run.

INSEASON ABUNDANCE ESTIMATES

Tarbox and Waltemyer (1989) provided detail about the assumptions used in the curve fitting procedures to estimate the *CCPUEF* statistic during the season. One of the major assumptions is that 24 June represents the first day of the sockeye salmon run to UCI. Variability in estimated runs can therefore result in an average or early run being misclassified as late, especially during the first 2 weeks of the test fishery program. For this reason, 20 July was chosen as the earliest date that inseason formal estimates of each year's total run size and run timing should be made. By then, there are enough data points in the current year's run timing curve to provide a more accurate estimate of the *CCPUEF*. In addition, Tarbox and King (1992) and later annual *Migratory timing and abundance estimates of sockeye salmon into Upper Cook Inlet, Alaska* project reports demonstrated that the initial first choice (best fit) estimate of the *CCPUEF* statistic and total run made around mid-July was often not the best fit estimate later in July. Therefore, when making formal inseason estimates of the total run, the top 5 or 6 best fits are evaluated. Careful consideration is given to years whose fits reveal the least day-to-day change in the predicted *CCPUEF*. These years are identified as potentially being the final best fit at the end of the season, especially if the *MSE* (Equation 8), also referred to as the mean sum of squares, statistic is also improving. Salmon run timing information from other areas of Alaska are also considered to help predict UCI run timing (Willette et al. 2010).

The formal abundance estimate of the 2015 UCI sockeye salmon run occurred on July 28, using commercial, sport and personal use harvests, escapement, and test fishery data through July 27 (Table 4). The 2015 test fishery *CCPUED* curve was mathematically compared to run curves from 1979 through 2014 (no estimate was made for 2013), and the estimates were ranked from best to worst based on *MSE*. The passage rate was estimated to be 2,797 fish per CPUE based on a run of 3.92 million fish through July 27 (includes residual fish abundance in the district). The 2015 test fishery *CCPUED* curve most closely tracked the 2006 run, estimating a *CCPUEF* of 2,106 index points. Given a passage rate of 2,797 fish per CPUE, the total run estimate was 5.89 million fish. As cautioned earlier, the first best fit (lowest *MSE*) on approximately 20 July often turns out to not be the best fit at the end of July, and therefore the top 5 fits were considered, which included run timing curves from 1990, 2005, 1994, and 1987 (in order of best fit). Using these data, total run estimates ranged from 3.99 to 5.89 million sockeye salmon. The best fits included runs from 2 to 9 days late.

The total sockeye salmon run to UCI in 2015 (postseason data) was estimated at approximately 6.30 million fish, including commercial, sport, and personal use harvests, as well as escapement to all systems (Table 5; Shields and Dupuis 2016). Therefore, the first best fit total run estimates from the formal inseason projection of the 2015 run was approximately 6.5% lower than the estimated run size. However, because the top 5 best fits from each analysis were given careful consideration inseason, the range in error from these projections are highlighted here. Based on data through July 27, the difference between the projected total run to UCI and the actual value ranged from 6.5% to 36.7%.

Using the July 27 total UCI run estimate, the total Kenai River sockeye salmon run was projected to range between 2.20 and 3.53 million fish (Table 6). Assuming 2.01 million Kenai River sockeye salmon had returned to date, that meant 0.19 to 1.52 million fish remained in the run. The preseason forecast for the Kenai River had projected a total run of 3.6 million fish, requiring commercial fisheries management to follow guidelines for a run of 2.3 to 4.6 million sockeye salmon. Three of the 5 best-fit estimates from the July 27 assessment projected a Kenai River run between 2.3 and 4.6 million fish; the remaining estimates projected a run below 2.3 million fish. The July 27 assessment indicated to ADF&G staff that the appropriate commercial fishery management approach was to continue to follow the guidelines for a run to the Kenai River of between 2.3 and 4.6 million fish. Using postseason data, the 2015 sockeye salmon run to the Kenai River was estimated to be approximately 3.89 million fish (Shields and Dupuis 2016).

OTF ERROR

OTF run forecast errors are largely a function of errors in estimating *CCPUEF,* which result from the algorithm that fits the current year's cumulative *CPUE* to run timing curves from earlier years. Early in the season, the curve-fitting algorithm tends to estimate that the current year's run timing curve best fits curves from previous years with later run timings resulting in overestimates of *CCPUEF*. Thus, forecast errors for total run, *CCPUEF*, and run timing tend to be positive early in the season, decreasing significantly as the season progresses (Figure 4). After approximately July 23, run forecast errors tend to stabilize within plus or minus 20%. Mean absolute percent errors (MAPE) average 40% from July 19–23, 9% from July 24–26, and 7% from July 27–31 (1996–2014). Prior to July 24, the model tends to over forecast small runs and more accurately forecast large runs; in contrast, forecast errors from July 24 to 26 are weakly positively related to run size, and forecast errors from July 27 to 31 are not related to run size (Figure 5). Prior to July 24, forecast MAPE is also a function of actual run timing (Table 5; Figure 6). MAPE is 34% for early runs and 15% for on-time or late runs. Forecast errors are also a function of actual run size.

In 2015, the first best-fit estimate for July 27 was the most accurate. The model selected the 2006 sockeye salmon run as the best fit. The 2006 run was unusually late and, by late July, there was confidence among ADF&G management staff that a run with the characteristics of 2006 would be realized in 2015. Although the 2006 run ended up being very close to the 2015 run with respect to run timing and total run size, management staff always consider the top 5 best-fit estimators because the remaining 4 produced reasonable estimates of run timing and the total run as well.

RUN TIMING

Although differences between annual inseason and postseason (adjusted by either harvest or total run) *CCPUEF* statistics were often relatively minor, they affected calculations of the *a* and *b* coefficients in the equations used to describe historical run timing curves (Equation 5), which in turn had an effect on estimates of subsequent *CCPUEF* values (Table 7). Beginning in 2002, the total run method was used to make postseason adjustments to all previous years' *CCPUEF* statistics (Shields 2003).

For the 2015 season, the test fishery *CCPUEF* of 1,609 was adjusted to 2,287 based on the number of fish that were commercially harvested and escaped after the test fishery ceased (Table 7). Therefore, this method estimated that approximately 25% of the sockeye salmon run occurred after the test fishery terminated (Appendix A14). Historical *a* and *b* coefficients calculated using total run-adjusted *CCPUEF* values are now used for all inseason run projections.

A nonlinear mathematical model (Mundy 1979) was fit to the *CCPUED* proportions of the 2015 sockeye salmon run to UCI. Using the total run-adjusted *CCPUEF*, this analysis suggested that 0.5% of the run had passed the OTF transect line prior to the start of test fishing on 1 July, and that the run was approximately 75% complete at project termination on July 30 (Appendix A14). Therefore, the mathematical model suggests the 2015 test fishery covered approximately 75% of the run. The test fishery passage rate for the season can be calculated by dividing the total number available to capture by the test fishery by the unadjusted *CCPUEF*. In 2015, the estimated final passage rate was approximately 2,829.

The midpoint of the 2015 UCI sockeye salmon run, or the day on which approximately 50% of the total run had entered UCI at the test fishery transect, occurred on day 32, or July 25, which was 10 days late compared to the historical mean date of 15 July (Table 8). This represents the latest midpoint in the history of the UCI OTF program.

ENVIRONMENTAL VARIABLES

In 2015, surface water temperatures measured along the southern OTF transect ranged from 9.6°C to 13.9°C and averaged 11.3°C for the year (Appendices A15–A16). These water temperature data were slightly higher than the 1992–2014 average surface water temperature of 10.4°C (Appendix A17). Air temperatures ranged from 10°C to 24°C and averaged 15°C. Wind velocity averaged 5 knots for the month. Wind direction was variable, but in general, winds originated out of the south, the predominant wind orientation in UCI during July. The 2015 seasonal average salinity of 29.1 ppt was slightly lower than the 1992–2014 average of 29.7 ppt. Koenings et al. (1987) describe a secchi disk as a black and white circular plate that is used to easily estimate the degree of visibility in natural waters. Secchi disk readings in 2015 were similar to the averages from all previous years. In general, water clarity along the test fishery transect decreases as you travel from east to west as a result of numerous glacial watersheds draining into the west side of Cook Inlet. From 2005 to 2014, the average secchi disk depth was 7.9 m at Station 4 and decreased to 3.2 m at Station 8. Finally, Station 4 was the shallowest station, averaging 24.9 fathoms (149 feet) in depth. Changes in depth are a result of different stages of tide, as well as minor differences in set location from day to day.

Monthly mean distributions of temperature and salinity along the southern OTF transect in 2015 indicated a surface layer of relatively turbid, warm, low-salinity water along the western side of Cook Inlet (Figure 7). A layer of relatively low-temperature, high-salinity water was evident along eastern side of the transect, near the surface at Station 4 and sloping to depth at Station 6. Chlorophyll *a* levels were generally higher near this core of cooler water near Station 4. Monthly mean temperatures at all stations were warmer (+0.45 °C) and salinities higher (+0.20 psu) at 1 m depth in 2015 compared to the mean for these parameters in 1996–2009. In our study, Stations 6–7 were generally located near the west and mid-channel rips, and Station 4 was located near the east rip as described by Burbank (1977), but the locations of these features moved daily in response to tides and winds. Monthly mean sockeye, chum, and coho salmon CPUEs (Table 3 and Appendix A) were generally highest near the west and mid-channel rips (Stations 6–7), whereas monthly mean pink salmon CPUE was highest near the east rip (Stations 4–5).

Water temperatures are believed by many to play a significant role in the timing of salmon runs (Burgner 1980), so these data have been closely monitored. In general, warmer water temperatures are thought to result in early runs, whereas cooler temperatures produce later runs. For example, in Bristol Bay, Burgner (1980) reported that the arrival dates of sockeye salmon were early during years when water temperatures were warmer than average. In a later Bristol Bay study, Ruggerone (1997) found that the change in temperature from winter to spring was a better predictor of run timing than water temperature alone. However, water temperature data alone may or may not be an accurate predictive tool for gauging the run timing of UCI salmon stocks. The 2005 UCI sockeye salmon run was the second latest run ever observed, yet surface water temperatures along the test fishery transect were the warmest ever measured. Conversely, the 2008 run was 4 days early, yet surface water temperatures were much cooler than average. Therefore, it appears that factors other than just water temperature probably play a role in determining salmon run timing in UCI. Pearcy (1992) summarized some of the factors that affect the coastal migration of returning adult salmon and found that prior to entering estuaries adult salmon probably rely on cues that are different from those used in the open ocean phases of their migration.

Although salinity, water temperature, currents, and bathymetry are all believed to play a role in migration, another dynamic to consider that could affect run timing to UCI is the stock composition of the run. When classifying total sockeye salmon run timing in UCI, the magnitude of the Kenai River run should be considered. Because Kenai River sockeye salmon return to UCI later and in larger numbers than any other stock, UCI runs classified as late tend to include large Kenai River runs. For example, from 1988 to 2015, the average Kenai River total run (DIDSON-based) for years where the UCI return was classified as early (n = 10), was 3.4 million fish, yet for UCI runs classified as on time or late (n = 16), the Kenai River run averaged 4.2 million fish. A combination of these factors (water temperature, salinity, currents, bathymetry, and stock composition of the run) probably affects fish migration and ultimately the classification of the run timing as early or late.

To better understand and predict sockeye salmon migrations into UCI, ADF&G conducted a companion study on the test fishery vessel from 2002 to 2005. Using side-looking sonar, fish distribution in the water column was measured in relation to various oceanographic data, such as water temperature, salinity, tide stage, and water clarity. This study also examined various methods for improving the OTF inseason run forecasts (Willette et al. 2010).

Genetic Stock Identification Tissue Sampling and Analyses

For the 2015 southern OTF, tissues suitable for genetic analysis were sampled from 1,590 sockeye salmon; these samples were archived for future analysis. Data retrieval and quality control results for the baseline collections are reported in Barclay and Habicht (2012).

Genetic information has been collected and analyzed from the southern OTF since 2006 (Appendices B1 and B2). The temporal data from 2006 through 2009 revealed similar findings (i.e., during the third and fourth weeks in July, Kenai River sockeye salmon were the dominant stock entering Cook Inlet, whereas during the first part of the month, Kasilof River sockeye salmon stocks were equally or more abundant than Kenai River stocks). However, data from 2010 to 2013 show that Kenai River sockeye salmon were the dominant stock throughout the month of July. The difference in stock composition between these time periods is probably the result of relatively strong sockeye salmon runs to the Kenai River from 2010 to 2013. The mixed stock analyses also showed that Susitna River sockeye salmon stocks (labeled as JCL and SusYen) made up an average of 9% of the total CPUE from 2006 to 2014 (Appendix B1). Spatial data were collected from the southern OTF from 2010 to 2012 (Appendix B2). These data show that the proportion of Kenai River sockeye salmon decreases from East to West (Station 4 to Station 8) and the proportion of West Cook Inlet stocks increases; the proportion of the remaining stocks stayed relatively stable.

The northern OTF project was operational from 2012 to 2014; therefore, the MSA data are limited. Temporal data from 2012 to 2014 show that Kenai River sockeye salmon were the dominant stock throughout the month of July (Appendix B3), which is similar to data collected at the southern OTF for these years. The 2012 MSA results showed that Kenai River sockeye salmon remained the dominant stock across the inlet from East to West (Stations 1–7). However, in 2013, Kenai River sockeye salmon were the dominant stock only at Stations 1–4; Stations 5–7 were dominated by West, JCL, and SusYen stocks combined. Although West, JCL, and SusYen made up a large proportion of the *CCPUEI* at Stations 5–7, the CPUE for West, JCL, and SusYen fish at these stations only accounted for 4% of the total *CCPUEF* at all stations in 2013 (Appendix B4). In 2014, Kenai River sockeye salmon were the dominant stock across both transects (north and south Kalgin transects; Appendix B4). On both transects, the proportion of West Cook Inlet stocks increased from east to west. The south Kalgin transect had a slightly higher proportion of Kasilof River sockeye salmon when compared to the north Kalgin transect and this proportion decreased from east to west.

In 2015, 402 coho salmon were sampled from the southern OTF project. Results from the MSA of coho salmon were unavailable at the time this report was published.

The efficacy of using MSA in combination with the test fishery for inseason management of the UCI commercial fishery remains unclear. Although it could be useful to know when specific stocks are entering the Central District, inter- and intra-annual variability in migration routes through the district would make adjusting commercial fishing periods to increase or decrease stock-specific exploitation problematic. The UCI test fisheries continue to provide fishery managers with important data about sockeye salmon stock composition, abundance, and run timing. Because commercial, sport, and personal use fishery management plans depend on inseason sockeye salmon run estimates, the UCI test fishery project remains one of the most essential tools available for the implementation of these plans.

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TABLES AND FIGURES

Table 1.–Summary of sockeye salmon fishing effort, daily and cumulative catch and CPUE, and mean fish length, Upper Cook Inlet southern offshore test fishery project, 2015.

Date	Number of stations	Total mean fishing time (min)	Catch		CPUE		Mean length (mm)
			Daily	Cum	Daily	Cum	
1 July	1[a]	53.5	1	1	1	1	509
2 July	6	237.0	7	8	5	6	542
3 July	6	223.5	12	20	9	15	536
4 July	6	241.5	21	41	15	30	545
5 July	6	239.5	3	44	2	33	546
6 July	6	225.0	20	64	15	48	536
7 July	6	231.5	13	77	10	58	538
8 July	6	232.0	12	89	8	66	529
9 July	6	232.5	18	107	13	80	518
10 July	6	281.0	30	137	16	95	546
11 July	6	249.5	34	171	24	119	536
12 July	6	238.0	23	194	17	136	537
13 July	6	251.0	25	219	18	154	547
14 July	6	246.0	52	271	42	196	541
15 July	6	236.5	24	295	18	214	545
16 July	0[a]	-	31	326	23	237	-
17 July	0[a]	-	36	362	28	265	-
18 July	0[a]	-	42	404	32	297	-
19 July	6	220.0	47	451	38	335	550
20 July	6	253.0	304	755	204	538	550
21 July	6	223.0	74	829	56	594	549
22 July	6	289.0	602	1,431	342	936	557
23 July	6	232.5	119	1,550	87	1,023	554
24 July	6	223.0	35	1,585	25	1,049	559
25 July	6	252.0	245	1,830	161	1,210	557
26 July	6	244.0	212	2,042	147	1,356	554
27 July	6	220.5	35	2,077	27	1,383	536
28 July	6	216.3	31	2,108	25	1,408	554
29 July	6	238.5	226	2,334	167	1,576	552
30 July	6	225.0	44	2,378	33	1,609	552

[a] Not all stations fished due to weather; the data for missing stations were interpolated.

Table 2.–Estimated sockeye salmon catch by date and station, Upper Cook Inlet southern offshore test fishery project, 2015.

	Station number						
Date	4	5	6	6.5	7	8	Total
1 July[a]	1	0	0	0	0	0	1
2 July	0	0	4	1	2	0	7
3 July	0	0	0	0	2	10	12
4 July	2	2	10	0	7	0	21
5 July	1	0	0	2	0	0	3
6 July	5	4	9	1	0	1	20
7 July	4	2	2	0	0	5	13
8 July	10	1	1	0	0	0	12
9 July	8	3	5	1	1	0	18
10 July	0	1	19	2	0	8	30
11 July	0	0	2	22	7	3	34
12 July	1	16	1	0	3	2	23
13 July	0	3	14	2	6	0	25
14 July	0	19	1	24	4	4	52
15 July	4	8	6	1	4	1	24
16 July[a]	3	8	6	3	8	3	31
17 July[a]	2	8	7	4	11	4	36
18 July[a]	1	8	6	6	15	6	42
19 July	0	8	7	7	18	7	47
20 July	1	73	24	96	98	12	304
21 July	8	50	11	1	1	3	74
22 July	1	160	146	145	127	23	602
23 July	2	1	30	44	39	3	119
24 July	0	1	3	5	25	1	35
25 July	3	9	40	30	55	108	245
26 July	7	32	77	48	28	20	212
27 July	0	1	0	1	6	27	35
28 July	3	17	0	0	3	8	31
29 July	6	106	41	11	52	10	226
30 July	4	21	7	3	3	6	44
Total	77	562	479	460	525	275	2,378
%	3%	24%	20%	19%	22%	12%	100%

[a] Not all stations fished due to weather; the data for missing stations were interpolated.

Table 3.–Estimated sockeye salmon CPUE by date and station, Upper Cook Inlet southern offshore test fishery project, 2015.

	Station number						
Date	4	5	6	6.5	7	8	Total
1 July[a]	1	0	0	0	0	0	1
2 July	0	0	3	1	1	0	5
3 July	0	0	0	0	2	8	9
4 July	2	2	7	0	5	0	15
5 July	1	0	0	2	0	0	2
6 July	4	3	7	1	0	1	15
7 July	3	2	2	0	0	3	10
8 July	7	1	1	0	0	0	8
9 July	5	2	4	1	1	0	13
10 July	0	1	9	1	0	4	16
11 July	0	0	2	14	5	3	24
12 July	1	12	1	0	2	2	17
13 July	0	2	10	2	4	0	18
14 July	0	13	1	22	3	3	42
15 July	3	6	4	1	3	1	18
16 July[a]	2	6	5	2	6	2	23
17 July[a]	1	6	5	4	9	3	28
18 July[a]	1	6	5	5	11	5	32
19 July	0	7	6	6	14	6	38
20 July	1	50	16	63	64	10	204
21 July	7	36	9	1	1	3	56
22 July	1	94	80	78	71	18	342
23 July	2	1	23	31	28	3	87
24 July	0	1	3	4	17	1	25
25 July	3	7	30	22	37	62	161
26 July	7	24	48	32	20	15	147
27 July	0	1	0	1	5	21	27
28 July	3	14	0	0	3	7	25
29 July	5	71	31	9	44	8	167
30 July	3	14	6	3	3	5	33
Total	60	381	315	304	357	191	1,609
%	4%	24%	20%	19%	22%	12%	100%

[a] Not all stations fished due to weather; the data for missing stations were interpolated.

Table 4.–Total run estimates for sockeye salmon to Upper Cook Inlet, Alaska, 2015.

Based on data through 7/27/2015	
Escapement	1,654,212
Cumulative catch (Commercial, Sport, & PU)	2,163,638
Residual in district	98,143
Total run through 7/27/2015 =	3,915,993
2015 Cumulative OTF CPUE through 7/27 =	1,400
Passage rate (total run/cumulative CPUE) through 7/27 =	2,797

Run estimates based on model results (fit of current year to past years)

	Mean sum	Estimated total CPUE				Estimated
Year	of squares	Current	Previous day	Difference	Timing	total run
2006	0.00896	2,106	2,072	35	Late 9 days	5,891,723
1990	0.01424	1,427	1,393	34	Late 3 days	3,991,320
2005	0.01694	1,799	1,756	43	Late 7 days	5,032,471
1994	0.01788	1,668	1,627	41	Late 4 days	4,665,598
1987	0.01829	1,498	1,460	38	Late 2 days	4,191,175
2007	0.01875	1,452	1,395	57	Late 4 days	4,060,074
1999	0.02243	1,326	1,270	56	Late 3 days	3,708,557
1992	0.02407	1,285	1,228	56	Late 2 days	3,593,343
2004	0.02746	1,323	1,264	60	Late 2 days	3,701,564
1991	0.02909	1,307	1,247	60	Late 2 days	3,654,796
1997	0.03224	1,411	1,345	66	Late 1 day	3,946,901
1998	0.03338	1,393	1,327	66	Late 3 days	3,897,700
2011	0.03339	1,202	1,143	59	Late 2 days	3,362,216
2014	0.04125	1,278	1,213	65	Late 1 day	3,574,798
1983	0.04347	1,229	1,165	64	On Time	3,437,710
1982	0.04632	1,271	1,204	67	Late 2 days	3,554,463
1995	0.04677	1,184	1,120	63	On Time	3,310,469
1986	0.04777	1,243	1,177	66	Late 1 day	3,477,094
1985	0.05541	1,231	1,164	68	On Time	3,444,256
1993	0.05556	1,196	1,130	66	Early 1 day	3,345,153
2003	0.05670	1,152	1,086	65	Early 2 days	3,220,988
1988	0.06031	1,205	1,137	68	Early 2 days	3,370,943
2012	0.06055	1,109	1,044	65	Early 1 day	3,100,963
2010	0.06318	1,242	1,172	70	Early 1 day	3,474,521
1989	0.06470	1,305	1,230	74	On Time	3,649,370
1996	0.06604	1,118	1,052	66	Early 2 days	3,127,983
2009	0.07382	1,099	1,032	67	Early 2 days	3,072,908
2000	0.08372	1,060	993	67	Early 2 days	2,963,763
2002	0.08447	1,088	1,020	68	Early 1 days	3,043,622
2001	0.08679	1,087	1,019	68	Early 2 days	3,039,314
1984	0.10274	1,082	1,012	70	Early 4 days	3,025,692
2008	0.10348	1,124	1,052	72	Early 4 days	3,144,151
1979	0.14195	1,022	951	71	Early 5 days	2,858,143
1980	0.19102	1012	939	73	Early 9 days	2,831,515
1981	0.19966	992	920	72	Early 9 days	2,775,404

Table 5.–Absolute percent error (APE) using the first best fit estimate of southern test fishery data on or after July 20 to project the estimated total annual UCI sockeye salmon run 1988–2015.

Year	Estimated total run (millions)	July 20 estimate	APE	Run timing
1988	8.52	11.30	32.6%	1 day early
1990	5.00	4.90	1.9%	4 day late
1991	3.66	3.90	6.5%	2 day late
1992	10.90	11.40	4.5%	2 day late
1993	6.48	6.40	1.2%	on time
1994	5.51	5.30	3.8%	5 day late
1995	4.51	4.50	0.2%	on time
1996	5.63	8.50	51.0%	1 day early
1997	6.41	6.00	6.4%	3 day late
1998	3.00	3.40	13.3%	3 day late
1999	4.57	5.20	13.7%	3 day late
2000	2.94	3.20	8.8%	2 day early
2001	3.53	6.20	75.4%	2 day early
2002	4.84	5.50	13.6%	2 day early
2003	6.29	6.79	8.0%	1 day early
2004	7.92	8.94	12.8%	2 day late
2005	7.92	9.17	15.8%	7 day late
2006	4.96	3.60	27.5%	9 day late
2007	5.44	4.65	14.6%	4 day late
2008	4.13	5.17	25.3%	4 day early
2009	4.29	9.11	112.5%	2 day early
2010[a]	5.26	4.69	10.8%	1 day early
2011	8.60	11.56	34.4%	2 day late
2012	6.61	6.73	1.8%	1 day early
2013[b]	-	-	-	-
2014	5.28	9.10	71.7%	1 day late
2015	6.30	5.89	6.5%	10 day late
			Average APE	Median APE
		All runs	22%	13%
		On time +	15%	10%
		All early	34%	19%

[a] Total run estimated by summing harvest and escapement throughout Upper Cook Inlet; in the Kenai and Kasilof rivers, escapements were converted to Bendix-equivalent units.

[b] Due to number of missed fishing days, the program was not used in 2013.

Table 6.–Projected total Kenai River sockeye salmon run (millions) in 2015 estimated from total southern OTF CPUE and age composition stock allocation.

Data through 27-July

		Est. total OTF CPUE										
Year	MSS	Current	Prev. day	Timing	Passage rate (total run/cum. CPUE)	Estimated UCI total run	Estimated UCI run to date[a]	Estimated UCI run remaining	Estimated Kenai run to date	Prop. Kenai	Estimated Kenai run remaining	Estimated total Kenai run
2006	0.00896	2,106	2,072	Late 9 days	2,797	5.89	3.72	2.17	2.008	70%	1.52	3.53
1990	0.01424	1,427	1,393	Late 3 days	2,797	3.99	3.72	0.27	2.008	70%	0.19	2.20
2005	0.01694	1,799	1,756	Late 7 days	2,797	5.03	3.72	1.31	2.008	70%	0.92	2.92
1994	0.01788	1,668	1,627	Late 4 days	2,797	4.67	3.72	0.94	2.008	70%	0.66	2.67
1987	0.01829	1,498	1,460	Late 2 days	2,797	4.19	3.72	0.47	2.008	70%	0.33	2.34

Note: MSS is the mean sum of squares

[a] Does not include residual fish still resident in the Central District.

Table 7.–The final unadjusted CPUE and total-run adjusted CPUE for the southern offshore test fishery with the corresponding *a* and *b* coefficients for the equations used to describe the run timing curves, 1979–2015.

Year	Final OTF CPUE	Total-run adjusted	Total-run adjusted *a*	Total-run adjusted *b*
1979	602	664	-3.3380	0.2004
1980	740	777	-2.2403	0.1612
1981	364	387	-2.5243	0.1819
1982	651	786	-3.7156	0.1633
1983	2,464	2,474	-4.2732	0.1884
1984	1,331	1,341	-3.4018	0.1834
1985	1,422	1,563	-3.5633	0.1626
1986	1,653	1,714	-3.8642	0.1719
1987	1,404	1,428	-4.6385	0.1785
1988	1,131	1,169	-3.5655	0.1662
1989	619	692	-2.7031	0.1238
1990	1,358	1,426	-5.7085	0.2211
1991	1,574	1,740	-4.6331	0.1919
1992	2,021	2,195	-5.4043	0.2217
1993	1,815	1,913	-3.9018	0.1797
1994	1,012	1,199	-3.9757	0.1453
1995	1,712	1,850	-4.6219	0.2078
1996	1,723	1,796	-4.4605	0.2144
1997	1,656	1,826	-3.7000	0.1496
1998	1,158	1,313	-3.7142	0.1515
1999	2,226	2,419	-5.1500	0.2081
2000	1,520	1,565	-4.9141	0.2480
2001	1,586	1,630	-3.9823	0.2041
2002	1,736	1,825	-4.0642	0.2068
2003	1,787	1,848	-4.4402	0.2068
2004	2,028	2,345	-4.6374	0.1903
2005	2,643	3,191	-3.7152	0.1302
2006	1,507	1,969	-4.0762	0.1308
2007	2,584	2,924	-4.6427	0.1793
2008	1,594	1,675	-2.8021	0.1521
2009	2,487	2,616	-4.4130	0.2173
2010	2,055	2,266	-3.1347	0.1459
2011	3,715	3,835	-5.5481	0.2304
2012	2,052	2,141	-5.0793	0.2399
2013[a]	1,342	-	-	-
2014	2,505	2,769	-3.9579	0.1711
2015	1,609	2,287	-7.0977	0.2216

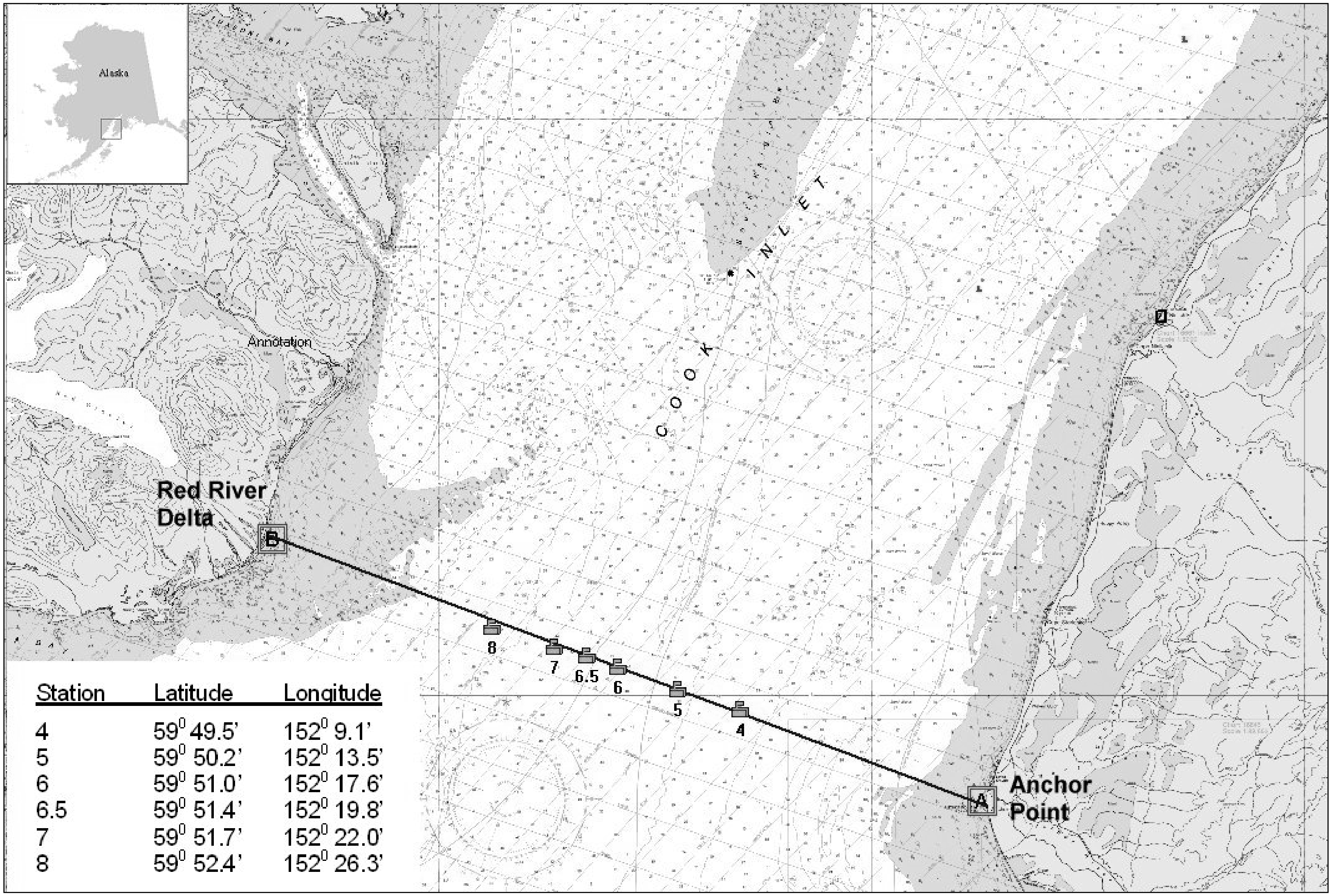
[a] No estimate for 2013 due to the high number of missed fishing days.

Table 8.–Midpoint of the Upper Cook Inlet sockeye salmon run at the southern offshore test fishery transect relative to day 1 (June 24), 1979–2015.

	Date[a]	
Year	Coded	Calendar
1979	16.7	10 Jul
1980	13.9	7 Jul
1981	13.9	7 Jul
1982	22.8	16 Jul
1983	22.7	16 Jul
1984	18.5	12 Jul
1985	21.9	15 Jul
1986	22.5	15 Jul
1987	26.0	19 Jul
1988	21.5	14 Jul
1989	21.8	15 Jul
1990	25.8	19 Jul
1991	24.1	17 Jul
1992	24.4	17 Jul
1993	21.7	15 Jul
1994	27.4	20 Jul
1995	22.2	15 Jul
1996	20.8	14 Jul
1997	24.7	18 Jul
1998	24.5	18 Jul
1999	24.7	18 Jul
2000	19.8	13 Jul
2001	19.5	13 Jul
2002	19.7	13 Jul
2003	21.5	14 Jul
2004	24.4	17 Jul
2005	28.5	22 Jul
2006	31.2	24 Jul
2007	25.9	19 Jul
2008	18.4	11 Jul
2009	20.3	13 Jul
2010	21.5	14 Jul
2011	24.1	17 Jul
2012	21.2	14 Jul
2013[b]	–	–
2014	23.1	16 Jul
2015	32.0	25 Jul
Average	22.3	15 Jul

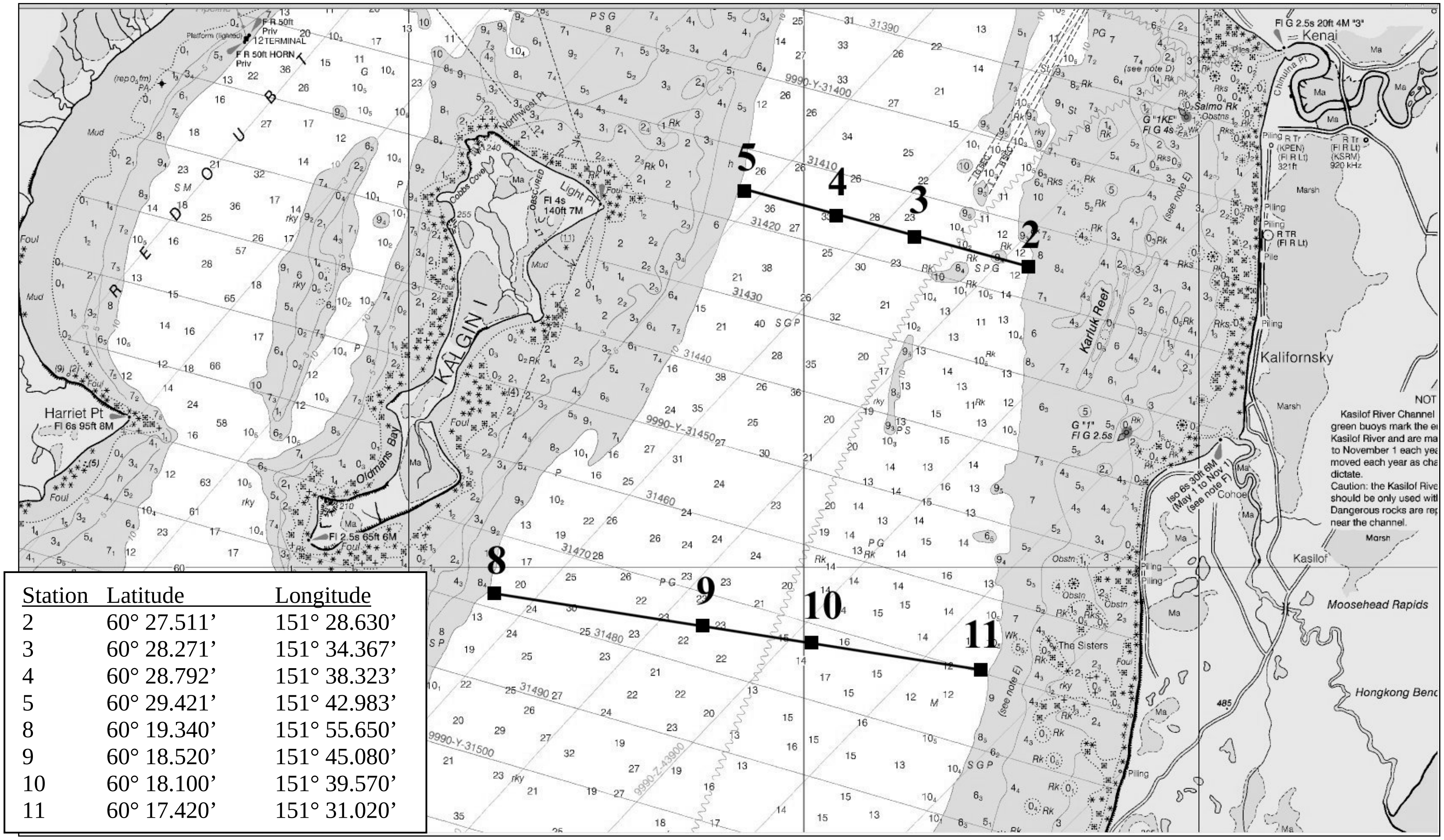
[a] Coded date 1 (June 24) represents the first day of the sockeye salmon run across the southern OTF transect.

[b] No estimate for 2013 due to the high number of missed fishing days.



Station	Latitude	Longitude
4	59^0 49.5’	152^0 9.1’
5	59^0 50.2’	152^0 13.5’
6	59^0 51.0’	152^0 17.6’
6.5	59^0 51.4’	152^0 19.8’
7	59^0 51.7’	152^0 22.0’
8	59^0 52.4’	152^0 26.3’

Figure 1.–Location of the southern offshore test fishery transect and fishing stations in Cook Inlet, Alaska, 2015.



Station	Latitude	Longitude
2	60° 27.511’	151° 28.630’
3	60° 28.271’	151° 34.367’
4	60° 28.792’	151° 38.323’
5	60° 29.421’	151° 42.983’
8	60° 19.340’	151° 55.650’
9	60° 18.520’	151° 45.080’
10	60° 18.100’	151° 39.570’
11	60° 17.420’	151° 31.020’

Figure 2.–Location of the northern offshore test fishery transects and fishing stations in Upper Cook Inlet, Alaska, 2014.

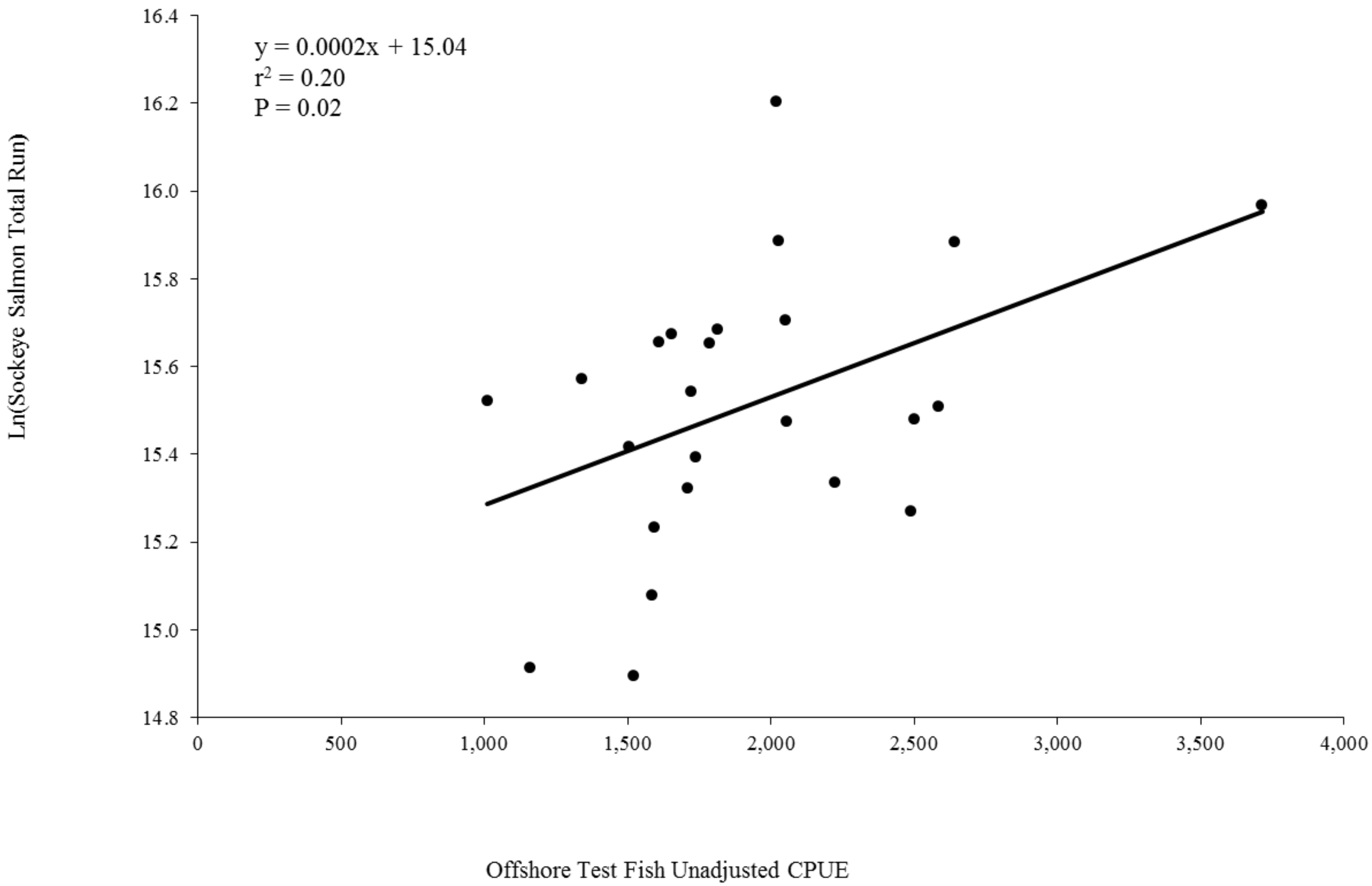


Figure 3.–Linear regression of the relationship between southern offshore test fishery unadjusted cumulative CPUE and Upper Cook Inlet logged (ln) sockeye salmon total annual run, 1992–2015.

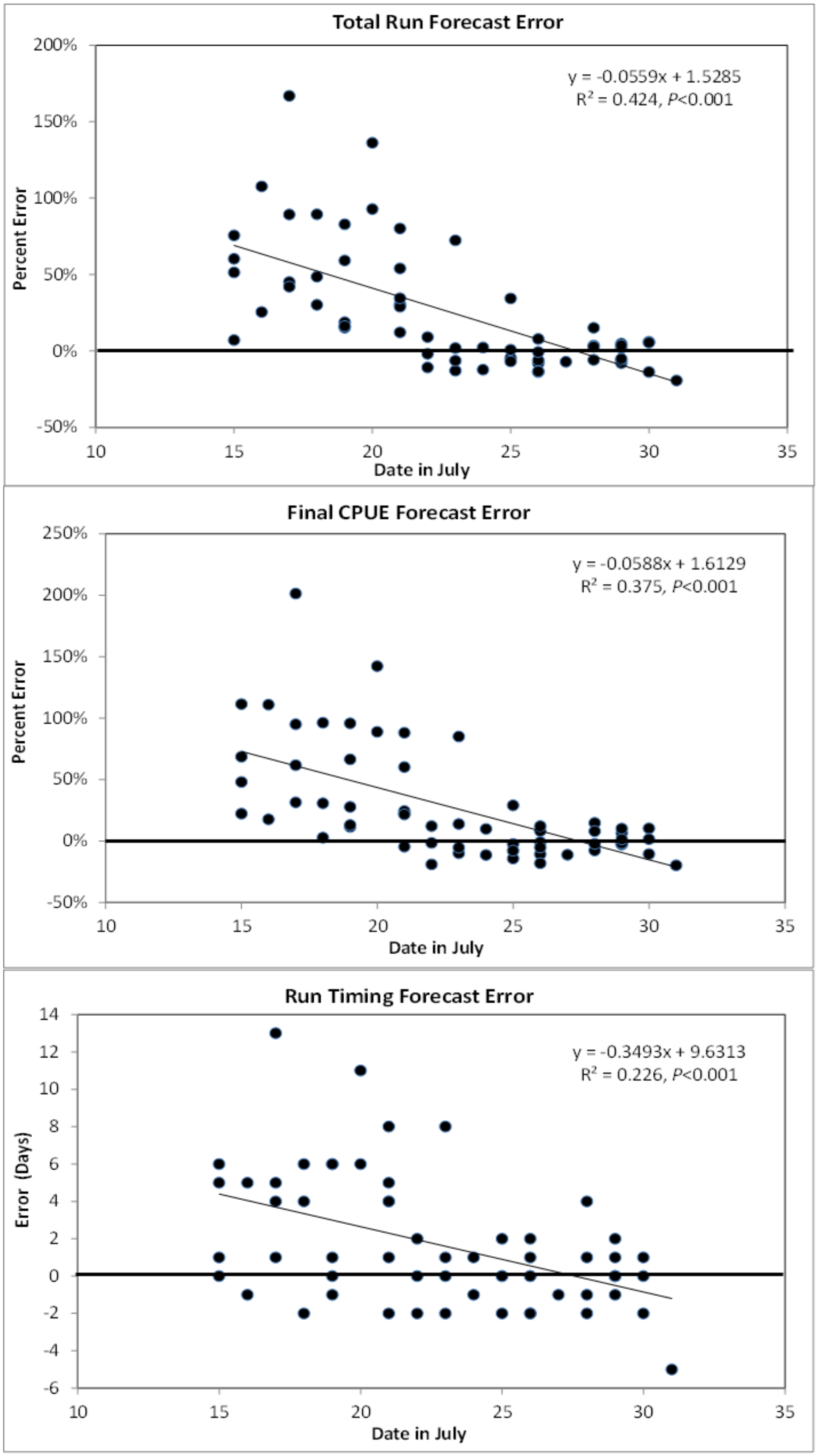


Figure 4.–Relationships between run forecast, final CPUE forecast, and run timing forecast errors and date in July when the forecasts were generated.

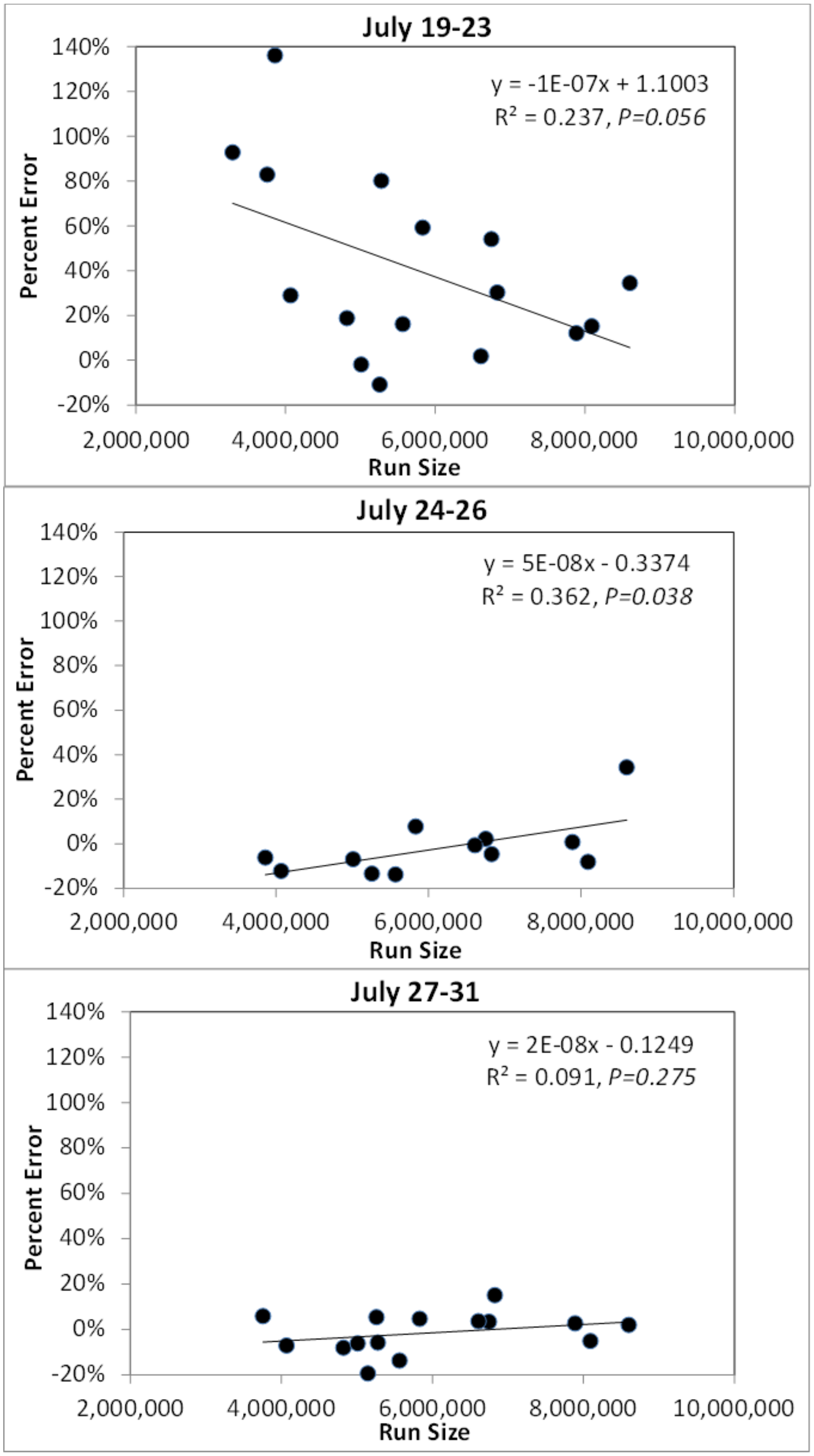


Figure 5.–Relationships between run forecast errors and actual run size for 3 date periods in July when the forecasts were generated (1996–2014).

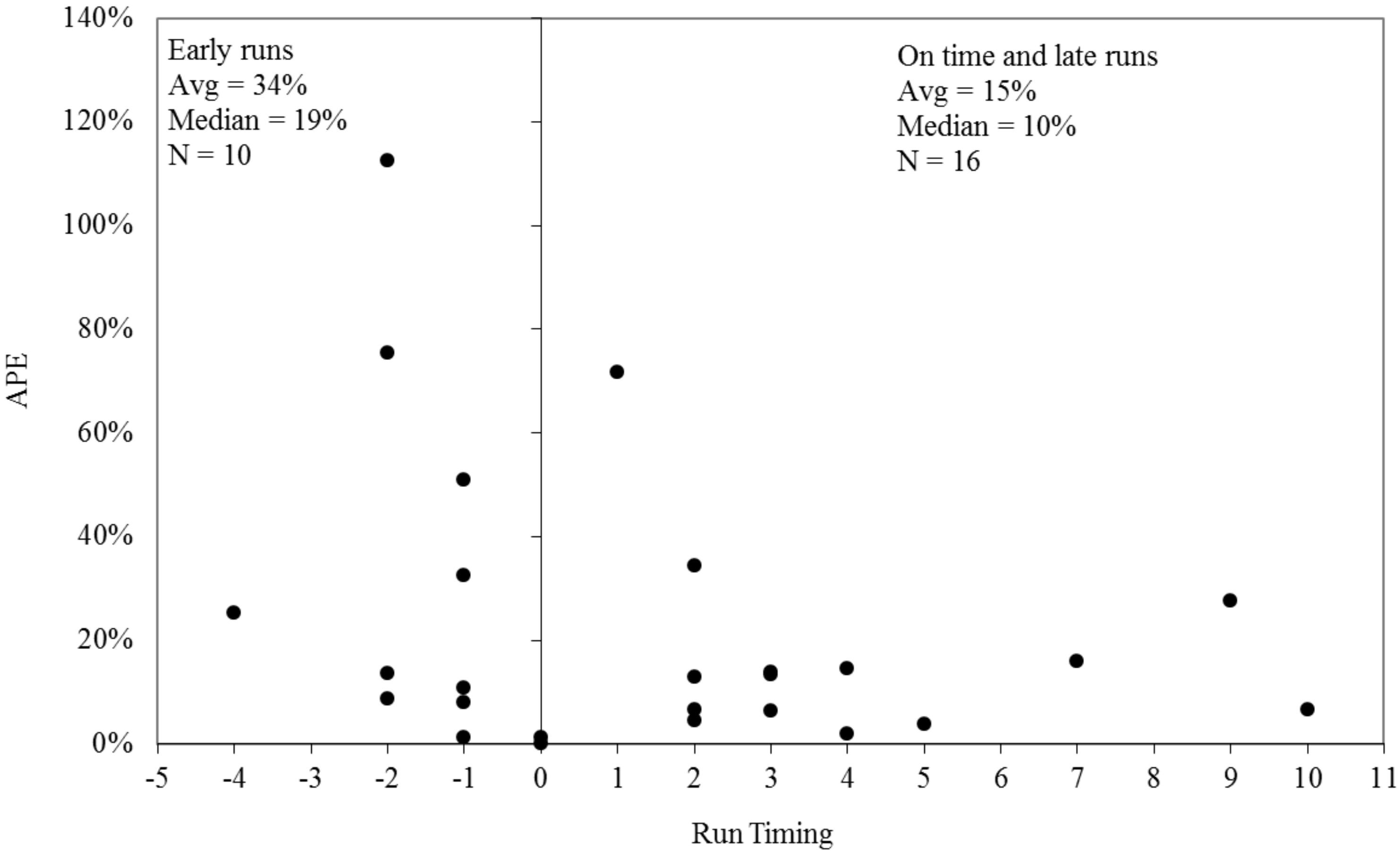


Figure 6.–Absolute percentage error (APE) in forecasting the total sockeye salmon run to Upper Cook Inlet using the July 20 best fit estimate, 1988–2015.

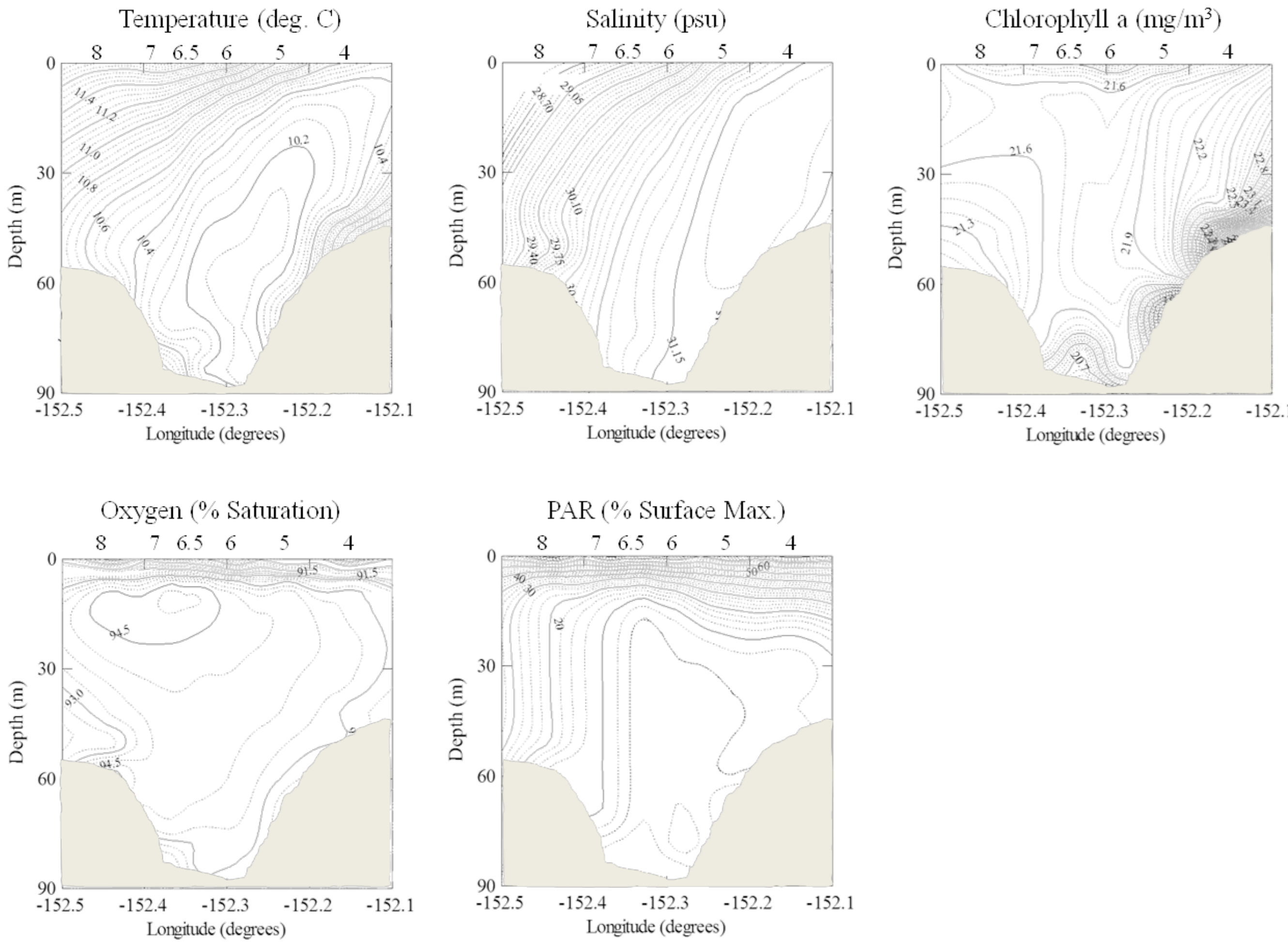


Figure 7.–Monthly mean distributions of temperature (°C), salinity (psu), chlorophyll *a* (mg/m^3), oxygen (percent saturation), and photosynthetically active radiation (PAR, percent surface max.) along the southern OTF transect in 2015.

Note: The solid areas indicate the bottom. Numbers across the top of each panel indicate stations along the transect.

APPENDIX A: SOUTHERN OFFSHORE TEST FISHERY 2015 SEASON DATA

Appendix A1.–Summary of pink salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet southern offshore test fishery project, 2015.

Date	Number of stations	Total mean fishing time (min)	Catch		CPUE	
			Daily	Cum	Daily	Cum
1 July	1[a]	53.5	0	0	0	0
2 July	6	237.0	0	0	0	0
3 July	6	223.5	2	2	2	2
4 July	6	241.5	1	3	1	2
5 July	6	239.5	0	3	0	2
6 July	6	225.0	1	4	1	3
7 July	6	231.5	1	5	1	4
8 July	6	232.0	2	7	2	6
9 July	6	232.5	2	9	1	7
10 July	6	281.0	5	14	4	11
11 July	6	249.5	3	17	2	13
12 July	6	238.0	5	22	4	17
13 July	6	251.0	7	29	5	22
14 July	6	246.0	5	34	4	25
15 July	6	236.5	11	45	8	33
16 July	0[a]	–	9	54	6	39
17 July	0[a]	–	7	61	5	44
18 July	0[a]	–	5	66	3	47
19 July	6	220.0	1	67	1	48
20 July	6	253.0	7	74	5	53
21 July	6	223.0	11	85	8	61
22 July	6	289.0	10	95	6	66
23 July	6	232.5	9	104	7	73
24 July	6	223.0	7	111	5	78
25 July	6	252.0	6	117	5	83
26 July	6	244.0	2	119	1	84
27 July	6	220.5	3	122	2	87
28 July	6	216.3	1	123	1	88
29 July	6	238.5	2	125	2	89
30 July	6	225.0	4	129	3	92

[a] Not all stations fished due to weather; the data for missing stations were interpolated.

Appendix A2.–Estimated pink salmon catch by date and station, Upper Cook Inlet southern offshore test fishery project, 2015.

	Station number						
Date	4	5	6	6.5	7	8	Total
1 July[a]	0	0	0	0	0	0	0
2 July	0	0	0	0	0	0	0
3 July	1	1	0	0	0	0	2
4 July	0	1	0	0	0	0	1
5 July	0	0	0	0	0	0	0
6 July	0	0	1	0	0	0	1
7 July	0	1	0	0	0	0	1
8 July	0	0	2	0	0	0	2
9 July	2	0	0	0	0	0	2
10 July	2	2	0	0	1	0	5
11 July	1	0	0	1	1	0	3
12 July	1	3	0	0	1	0	5
13 July	0	1	5	0	0	1	7
14 July	0	4	0	1	0	0	5
15 July	3	6	2	0	0	0	11
16 July[a]	2	5	2	0	0	0	9
17 July[a]	2	3	1	1	0	0	7
18 July[a]	1	2	1	1	0	0	5
19 July	0	0	0	1	0	0	1
20 July	0	0	0	4	1	2	7
21 July	3	6	1	0	0	1	11
22 July	0	1	4	3	2	0	10
23 July	0	1	2	1	2	3	9
24 July	1	0	0	0	6	0	7
25 July	0	2	2	1	0	1	6
26 July	0	1	0	1	0	0	2
27 July	1	1	0	0	1	0	3
28 July	0	0	0	1	0	0	1
29 July	2	0	0	0	0	0	2
30 July	2	1	0	0	1	0	4
Total	24	42	23	16	16	8	129
%	19%	33%	18%	12%	12%	6%	100%

[a] Not all stations fished due to weather; the data for missing stations were interpolated.

Appendix A3.–Final cumulative catch and CPUE values by year for pink salmon, chum salmon, coho salmon, and Chinook salmon from the Upper Cook Inlet southern offshore test fishery project, 1992–2015.

	Pink		Chum		Coho		Chinook	
Year	Catch	CPUE	Catch	CPUE	Catch	CPUE	Catch	CPUE
1992	326	227	667	443	444	299	3	3
1993	53	45	205	153	325	258	5	4
1994	227	166	521	345	752	513	1	1
1995	155	97	1,129	687	941	595	3	2
1996	119	84	491	319	758	534	3	2
1997	203	158	420	306	502	375	4	3
1998	556	406	438	312	547	403	3	2
1999	31	23	451	331	404	307	7	6
2000	908	608	1,031	672	1,157	766	2	1
2001	283	229	933	655	1,209	838	11	8
2002	809	572	1,537	1,013	1,184	798	6	4
2003	182	126	1,000	713	506	368	13	10
2004	650	439	652	447	1,119	785	4	3
2005	186	150	448	300	546	344	8	6
2006	1,023	655	988	635	1,613	1,037	12	8
2007	348	247	398	265	692	482	5	4
2008	306	226	405	273	1,024	718	3	2
2009	701	526	454	303	512	361	11	8
2010	266	176	1,155	736	700	454	3	2
2011	90	64	768	532	374	264	7	5
2012	277	210	664	527	200	154	5	4
2013	53	36	302	197	800	495	4	3
2014	848	694	579	457	752	655	4	3
1992–2014 Avg	374	268	680	462	742	513	6	4
2015	129	92	1,091	704	411	277	7	4

Appendix A4.–Entry pattern of sockeye salmon into Upper Cook Inlet, Alaska, 2015 estimated from daily CPUE data fit to the run-timing model (Equation 5).

Day	Date	Input y	Model estimated ($Y_{yr,d}$)	Residual	Change in input Y	Change in estimated Y
8	1 Jul	0.0003	0.0048			
9	2 Jul	0.0025	0.0060	0.0035	0.0023	0.0012
10	3 Jul	0.0066	0.0075	0.0009	0.0041	0.0015
11	4 Jul	0.0133	0.0094	0.0039	0.0066	0.0018
12	5 Jul	0.0143	0.0117	0.0027	0.0010	0.0023
13	6 Jul	0.0211	0.0145	0.0065	0.0067	0.0029
14	7 Jul	0.0253	0.0181	0.0073	0.0042	0.0035
15	8 Jul	0.0290	0.0224	0.0065	0.0037	0.0044
16	9 Jul	0.0348	0.0279	0.0069	0.0058	0.0054
17	10 Jul	0.0416	0.0345	0.0071	0.0068	0.0067
18	11 Jul	0.0520	0.0427	0.0093	0.0105	0.0082
19	12 Jul	0.0596	0.0528	0.0068	0.0075	0.0100
20	13 Jul	0.0675	0.0650	0.0025	0.0079	0.0122
21	14 Jul	0.0857	0.0798	0.0058	0.0182	0.0148
22	15 Jul	0.0934	0.0977	0.0043	0.0078	0.0179
23	16 Jul	0.1035	0.1191	0.0156	0.0100	0.0213
24	17 Jul	0.1157	0.1443	0.0287	0.0122	0.0253
25	18 Jul	0.1298	0.1739	0.0441	0.0142	0.0296
26	19 Jul	0.1463	0.2081	0.0617	0.0165	0.0342
27	20 Jul	0.2354	0.2469	0.0115	0.0891	0.0389
28	21 Jul	0.2597	0.2904	0.0306	0.0243	0.0435
29	22 Jul	0.4094	0.3381	0.0714	0.1497	0.0477
30	23 Jul	0.4475	0.3893	0.0582	0.0380	0.0512
31	24 Jul	0.4586	0.4430	0.0156	0.0111	0.0538
32	25 Jul	0.5289	0.4982	0.0307	0.0703	0.0551
33	26 Jul	0.5930	0.5534	0.0396	0.0641	0.0552
34	27 Jul	0.6047	0.6073	0.0026	0.0117	0.0539
35	28 Jul	0.6158	0.6587	0.0429	0.0111	0.0514
36	29 Jul	0.6889	0.7066	0.0177	0.0731	0.0479
37	30 Jul	0.7034	0.7504	0.0470	0.0145	0.0438

Appendix A5.–Chemical and physical observations made in Upper Cook Inlet, Alaska, during the 2015 southern offshore test fishery project.

Date	Sta	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Tide stage	Salinity (ppt)	Water depth (f)	Secchi (m)
1 Jul	4	11	–	4	southwest	ebb	–	23.1	8.5
	5	–	–	–	–	–	–	–	–
	6	–	–	–	–	–	–	–	–
	6.5	–	–	–	–	–	–	–	–
	7	–	–	–	–	–	–	–	–
	8	–	–	–	–	–	–	–	–
2 Jul	4	15	–	0	northeast	ebb	–	22.2	8.5
	5	15	9.7	2	northeast	ebb	31.3	34.3	7.0
	6	15	9.9	1	northeast	ebb	30.6	46.4	4.0
	6.5	20	10.1	4	east	flood	30.4	42.0	4.5
	7	23	10.6	4	east	flood	29.7	54.6	4.0
	8	23	10.3	2	north	flood	30.1	27.6	3.0
3 Jul	8	13	10.4	8	northwest	ebb	29.0	32.1	2.5
	7	11	10.0	8	northeast	ebb	30.3	45.7	4.0
	6.5	12	10.0	4	north	ebb	30.6	38.7	4.5
	6	15	10.2	2	north	ebb	30.4	48.1	4.0
	5	14	9.7	2	north	ebb	31.6	28.0	9.0
	4	14	10.0	7	southeast	ebb	31.6	21.7	7.0
4 Jul	4	12	9.6	8	southeast	ebb	31.4	23.0	7.0
	5	11	9.8	2	east	ebb	31.3	28.5	5.5
	6	12	10.4	10	northeast	ebb	30.4	46.2	2.5
	6.5	11	10.4	20	northeast	flood	30.1	45.0	2.0
	7	11	10.3	19	northeast	flood	30.3	46.2	2.0
	8	12	10.4	23	northeast	flood	30.1	30.5	2.5
5 Jul	8	12	10.6	5	north	flood	29.6	32.0	2.0
	7	12	10.2	3	north	ebb	30.5	47.0	4.0
	6.5	12	9.9	6	north	ebb	30.8	34.7	4.5
	6	12	9.7	7	north	ebb	31.0	48.2	5.5
	5	12	9.6	7	north	ebb	31.3	32.1	8.0
	4	12	9.9	10	north	ebb	31.6	20.4	7.5
6 Jul	4	12	9.8	3	north	ebb	31.4	25.4	9.5
	5	12	9.7	4	north	ebb	31.1	35.2	7.0
	6	12	10.8	7	northwest	ebb	29.6	44.8	2.5
	6.5	18	10.8	2	north	ebb	29.9	41.4	2.0
	7	15	10.9	4	north	low	29.7	43.3	2.5
	8	12	10.9	10	north	flood	29.5	29.3	1.5

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Date	Sta	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Tide stage	Salinity (ppt)	Water depth (f)	Secchi (m)
7 Jul	8	10	10.8	5	southwest	flood	29.5	32.1	2.0
	7	11	10.4	4	south	high	30.2	44.1	3.0
	6.5	11	10.2	3	southeast	high	30.5	39.2	4.0
	6	13	10.2	2	south	ebb	30.7	49.8	6.0
	5	14	10.4	4	south	ebb	31.5	35.5	8.5
	4	16	10.3	4	south	ebb	31.8	22.3	8.5
8 Jul	4	11	9.9	7	south	flood	31.2	25.5	8.5
	5	13	10.8	4	southwest	ebb	30.5	35.4	5.0
	6	13	11.0	3	southwest	ebb	29.8	31.3	2.5
	6.5	14	10.9	7	southwest	ebb	29.7	42.1	2.5
	7	12	11.0	7	south	ebb	29.7	45.4	2.5
	8	12	11.0	6	southwest	flood	29.5	27.6	1.5
9 Jul	8	12	10.8	6	south	flood	29.4	30.8	1.5
	7	11	11.0	7	south	flood	29.5	45.8	2.5
	6.5	12	10.9	6	south	flood	29.6	43.9	2.5
	6	12	10.5	8	south	flood	30.3	48.9	4.0
	5	12	10.0	8	south	flood	31.3	37.1	7.0
	4	13	10.0	6	south	high	31.5	25.5	10.5
10 Jul	4	21	10.3	1	south	ebb	31.3	26.2	4.5
	5	17	12.3	3	south	ebb	29.2	35.6	3.5
	6	16	12.8	7	south	ebb	28.3	45.7	2.5
	6.5	15	11.8	6	southwest	ebb	29.3	41.3	3.0
	7	15	11.5	5	southwest	flood	29.3	44.9	3.5
	8	13	11.3	4	southwest	flood	29.4	26.5	3.0
11 Jul	8	11	11.1	6	south	ebb	29.5	27.7	3.5
	7	13	11.8	5	south	ebb	28.4	45.0	2.5
	6.5	13	12.2	2	south	flood	28.4	43.0	2.5
	6	14	10.8	2	south	flood	30.3	48.1	4.0
	5	14	10.6	0	south	flood	31.3	36.5	10.5
	4	15	10.3	0	south	flood	31.6	14.0	9.5
12 Jul	4	12	10.4	0	south	ebb	31.3	23.7	7.7
	5	13	11.1	3	west	ebb	30.1	36.3	5.0
	6	12	11.5	3	west	ebb	28.9	46.9	3.0
	6.5	12	11.5	3	west	low	28.9	44.0	3.0
	7	11	11.4	2	west	low	–	46.0	3.0
	8	11	11.5	10	west	flood	–	31.7	2.0

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Date	Sta	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Tide stage	Salinity (ppt)	Water depth (f)	Secchi (m)
13 Jul	8	11	11.3	5	west	ebb	29.1	31.1	2.0
	7	11	11.3	10	northwest	ebb	29.1	45.4	4.0
	6.5	12	11.4	6	northwest	ebb	29.1	41.4	3.5
	6	12	11.8	0	northwest	ebb	28.4	44.9	2.5
	5	12	10.5	3	northwest	flood	31.0	35.0	7.0
	4	12	10.4	0	west	flood	31.4	23.6	7.0
14 Jul	4	14	10.7	1	north	flood	31.1	24.5	9.0
	5	15	10.9	5	northwest	flood	31.2	36.3	7.5
	6	17	10.9	3	northwest	flood	30.8	47.0	9.5
	6.5	16	10.5	0	northwest	flood	30.9	46.5	7.5
	7	12	11.5	0	west	ebb	29.1	45.8	2.0
	8	12	11.3	8	west	ebb	29.0	30.0	2.0
15 Jul	8	12	11.2	3	west	ebb	29.2	31.0	4.5
	7	12	11.2	6	southwest	ebb	29.3	43.5	4.0
	6.5	13	11.4	5	south	ebb	29.3	41.7	4.0
	4	14	10.8	1	north	flood	30.0	25.7	9.0
	5	14	10.5	1	north	flood	31.2	37.7	7.0
	6	13	11.2	3	north	flood	31.1	54.0	5.0
16 Jul	4	–	–	–	–	–	–	–	–
	5	–	–	–	–	–	–	–	–
	6	–	–	–	–	–	–	–	–
	6.5	–	–	–	–	–	–	–	–
	7	–	–	–	–	–	–	–	–
	8	–	–	–	–	–	–	–	–
17 Jul	8	–	–	–	–	–	–	–	–
	7	–	–	–	–	–	–	–	–
	6.5	–	–	–	–	–	–	–	–
	6	–	–	–	–	–	–	–	–
	5	–	–	–	–	–	–	–	–
	4	–	–	–	–	–	–	–	–
18 Jul	4	–	–	–	–	–	–	–	–
	5	–	–	–	–	–	–	–	–
	6	–	–	–	–	–	–	–	–
	6.5	–	–	–	–	–	–	–	–
	7	–	–	–	–	–	–	–	–
	8	–	–	–	–	–	–	–	–

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Date	Sta	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Tide stage	Salinity (ppt)	Water depth (f)	Secchi (m)
19 Jul	4	24	10.8	11	south	ebb	31.1	23.5	7.0
	5	20	11.2	1	south	low	31.1	37.2	6.0
	6	18	11.4	0	south	flood	30.4	46.8	5.5
	6.5	19	11.5	0	south	flood	30.1	44.2	5.5
	7	21	12.2	0	south	flood	29.4	47.6	2.5
	8	22	12.0	0	south	flood	29.5	27.7	4.4
20 Jul	8	17	11.6	2	north	flood	29.1	33.0	2.0
	7	20	11.4	0	north	flood	30.1	47.2	4.0
	6.5	18	11.0	0	north	high	30.1	43.0	3.5
	6	17	11.0	0	north	ebb	30.8	50.6	6.0
	5	18	11.3	0	north	ebb	30.9	33.6	6.5
	4	16	10.6	0	north	ebb	31.4	23.4	9.5
21 Jul	4	20	10.3	1	southeast	ebb	31.2	26.6	9.0
	5	15	10.5	4	southeast	ebb	31.1	32.1	7.0
	6	15	11.7	5	south	ebb	29.3	45.6	3.4
	6.5	15	12.0	3	south	ebb	29.2	38.9	3.0
	7	18	11.9	6	south	ebb	29.3	45.9	3.5
	8	18	12.3	5	south	ebb	29.5	27.6	2.0
22 Jul	8	19	11.9	6	southwest	flood	28.9	32.9	2.0
	7	13	11.9	2	southwest	high	29.1	46.9	2.0
	6.5	14	10.0	8	south	ebb	–	45.4	3.0
	6	15	12.1	3	south	ebb	29.0	46.9	3.5
	5	13	12.1	4	southwest	ebb	29.3	36.4	4.5
	4	12	10.6	4	south	ebb	31.2	24.2	8.0
23 Jul	4	20	11.0	10	northwest	ebb	31.0	26.3	12.0
	5	20	11.7	4	south	ebb	30.8	36.9	7.0
	6	20	12.5	4	southwest	low	30.0	49.2	4.0
	6.5	24	12.9	4	southwest	flood	29.6	43.5	5.0
	7	10	13.3	3	southwest	flood	28.3	48.0	3.0
	8	19	12.9	5	southwest	flood	28.7	30.9	4.1
24 Jul	8	18	12.4	2	south	ebb	27.4	31.6	2.5
	7	17	12.5	3	south	ebb	27.6	47.0	3.5
	6.5	17	11.5	5	south	flood	30.2	45.1	3.0
	6	16	11.4	4	southeast	flood	30.4	50.2	6.0
	5	14	11.0	4	southeast	flood	31.3	38.3	9.0
	4	16	10.5	2	southeast	flood	31.4	25.7	10.5

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Date	Sta	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Tide stage	Salinity (ppt)	Water depth (f)	Secchi (m)
25 Jul	4	18	10.7	12	south	flood	31.1	26.2	5.0
	5	21	11.8	13	south	flood	30.2	37.4	6.0
	6	19	13.1	7	south	flood	26.9	44.1	3.5
	6.5	20	13.2	6	south	flood	26.9	43.3	3.0
	7	20	13.2	8	south	flood	26.8	47.1	3.5
	8	19	13.5	9	south	high	27.0	27.7	3.5
26 Jul	8	16	12.2	9	south	ebb	28.6	31.3	2.0
	7	16	12.7	6	south	ebb	27.3	46.8	4.0
	6.5	18	12.8	6	south	ebb	27.1	40.8	3.5
	6	19	13.0	7	south	flood	27.2	50.5	3.0
	5	16	12.6	12	south	flood	28.6	33.9	4.0
	4	13	11.7	16	south	ebb	30.2	25.5	6.0
27 Jul	4	15	12.7	0	south	ebb	27.8	24.6	5.0
	5	16	12.8	0	south	low	27.8	36.6	5.0
	6	19	13.3	0	south	flood	27.1	48.8	4.0
	6.5	19	13.9	0	south	flood	26.2	44.2	3.5
	7	21	13.6	0	south	flood	26.8	46.9	2.5
	8	21	13.0	0	south	flood	25.0	28.2	2.5
28 Jul	8	15	12.3	2	southeast	ebb	28.6	29.7	3.5
	7	13	12.4	0	southeast	ebb	28.7	45.6	4.0
	6.5	14	12.9	2	southeast	ebb	27.9	43.1	4.0
	6	16	12.9	0	southeast	ebb	28.2	48.2	5.0
	5	16	13.4	5	south	low	28.1	37.2	5.0
	4	16	11.3	6	southeast	flood	30.9	25.1	7.5
29 Jul	4	18	11.4	0	south	flood	30.6	44.3	8.0
	5	14	12.3	7	southwest	flood	30.4	37.1	7.0
	6	14	12.2	2	southwest	flood	29.5	49.0	7.0
	6.5	16	12.4	8	southwest	flood	27.1	45.5	5.0
	7	19	13.9	6	southwest	flood	27.3	48.1	4.0
	8	15	13.1	3	south	high	26.6	31.2	4.0
30 Jul	8	19	12.5	8	southwest	ebb	28.6	29.6	2.5
	7	18	12.6	9	south	ebb	28.4	46.5	3.5
	6.5	14	12.3	8	southwest	ebb	28.6	43.7	3.5
	6	13	12.1	4	southwest	low	28.0	50.0	3.0
	5	14	11.7	6	southwest	flood	30.4	38.3	0.5
	4	12	11.1	5	southwest	flood	26.8	31.1	0.5
Averages		15	11.3	5	south	ebb	29.7	37.7	4.7
Min		10	9.6	0	–	–	25.0	14.0	0.5
Max		24	13.9	23	–	–	31.8	54.6	12.0

Note: Dashes indicate missing data.

Appendix A6.–Yearly mean values of physical observations made from the southern offshore test fishery project, 2002–2015.

Sta	Year	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Salinity (ppt)	Water depth (f)	Secchi (m)
4	2002	12.6	9.5	12.6	S	31.4	23.6	8.1
	2003	14.1	10.6	12.0	S	31.2	23.4	8.3
	2004	10.7	9.6	7.1	E	31.3	23.8	7.9
	2005	12.9	10.9	6.2	S	31.0	24.5	7.4
	2006	11.1	9.9	6.0	SE	30.7	23.9	7.7
	2007	10.8	8.6	4.7	SE	31.2	23.9	8.1
	2008	11.0	9.3	8.0	SE	30.6	22.8	8.5
	2009	11.0	9.1	6.2	SE	33.3	24.4	7.3
	2010	10.7	9.6	5.9	S	31.2	24.1	7.6
	2011	10.8	8.8	3.7	S	31.5	23.9	7.7
	2012	10.8	8.9	4.8	SE	30.5	25.4	8.9
	2013	11.4	9.4	5.2	S	30.9	45.4	8.4
	2014	12.5	10.3	6.0	SE	32.9	24.9	7.8
	2015	15.0	10.6	4.4	SE	30.9	24.9	7.8
	Avg	11.8	9.6	6.6	SE	31.3	25.6	8.0

Sta	Year	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Salinity (ppt)	Water depth (f)	Secchi (m)
6	2002	12.8	10.1	13.4	S	30.4	45.1	4.2
	2003	14.7	11.5	12.9	S	29.5	46.4	4.9
	2004	10.6	10.3	8.0	SE	30.1	46.6	4.6
	2005	12.8	11.6	8.0	S	29.4	45.8	4.7
	2006	12.8	11.6	8.0	S	29.8	45.8	4.7
	2007	11.0	9.5	6.0	S	30.0	47.2	4.8
	2008	10.4	9.3	6.2	S	29.5	47.3	5.0
	2009	11.5	10.2	6.0	SE	31.3	46.7	4.0
	2010	11.2	9.9	6.1	S	30.1	46.6	4.7
	2011	11.7	9.8	3.2	S	30.6	45.7	5.0
	2012	11.1	9.7	5.6	SE	29.2	48.2	5.1
	2013	11.6	10.0	6.7	S	31.1	84.2	3.9
	2014	12.7	11.0	6.5	S	31.3	48.2	4.3
	2015	15.0	11.5	3.6	S	29.5	47.3	4.3
	Avg	12.1	10.4	7.2	S	30.1	49.4	4.6

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Sta	Year	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Salinity (ppt)	Water depth (f)	Secchi (m)
5	2002	12.8	9.7	13.9	S	30.9	35.8	6.3
	2003	14.0	11.0	13.3	SE	30.6	35.7	6.3
	2004	10.7	9.9	7.2	SE	30.7	34.7	7.1
	2005	13.1	11.1	5.9	S	30.6	36.3	6.5
	2006	11.1	10.2	7.6	S	30.2	35.4	5.6
	2007	10.8	8.7	4.6	S	30.9	35.4	7.2
	2008	10.4	8.8	6.7	SE	30.4	35.4	6.4
	2009	11.1	9.6	6.6	SE	32.4	35.9	5.8
	2010	11.0	9.5	5.5	SE	30.8	35.3	6.7
	2011	11.6	9.2	4.0	S	31.1	36.0	6.4
	2012	11.0	9.2	5.7	SE	30.1	36.8	7.2
	2013	11.0	9.8	5.4	S	31.1	68.5	5.4
	2014	12.7	10.7	5.9	SE	32.2	37.0	6.6
	2015	14.8	11.1	4.2	SE	30.5	35.3	6.3
	Avg	11.9	9.9	6.9	SE	30.9	38.1	6.4

Sta	Year	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Salinity (ppt)	Water depth (f)	Secchi (m)
6.5	2002	12.6	10.4	13.7	S	30.0	42.6	3.3
	2003	14.4	11.7	14.9	S	29.1	41.3	4.1
	2004	10.7	10.8	10.1	SE	29.4	41.6	3.6
	2005	13.2	12.2	7.4	S	28.7	42.8	4.2
	2006	11.2	10.3	8.5	SE	29.7	41.6	3.4
	2007	11.1	9.7	6.2	S	29.8	42.9	4.3
	2008	10.4	9.6	6.3	S	29.2	42.3	4.4
	2009	11.8	10.4	6.4	S	31.0	42.5	3.7
	2010	11.2	10.1	6.2	S	29.7	41.7	3.7
	2011	11.3	10.2	4.5	S	29.9	42.5	4.2
	2012	11.3	9.9	4.5	SE	28.9	44.0	4.7
	2013	11.3	10.5	5.8	S	31.2	79.4	3.5
	2014	13.0	11.3	6.8	S	30.8	42.0	3.9
	2015	15.3	11.5	4.8	S	28.1	42.5	3.7
	Avg	12.1	10.6	7.6	S	29.7	45.0	3.9

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Appendix A6.–Page 3 of 3.

Sta	Year	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Salinity (ppt)	Water depth (f)	Secchi (m)
7	2002	12.4	10.4	12.4	SE	29.9	44.0	2.8
	2003	14.3	11.6	13.0	S	29.0	44.3	3.6
	2004	10.6	11.0	9.7	SE	28.8	44.7	2.7
	2005	12.9	12.3	7.6	S	28.3	44.8	3.6
	2006	10.8	9.9	6.8	S	29.4	42.4	3.1
	2007	11.2	9.9	6.2	S	29.5	45.5	3.8
	2008	10.6	9.8	6.2	S	29.4	44.9	4.2
	2009	11.7	10.4	5.5	S	31.2	45.0	3.5
	2010	11.4	10.3	5.7	S	29.4	44.9	2.9
	2011	11.5	10.4	3.9	S	29.8	44.8	3.8
	2012	11.3	10.0	5.1	SE	28.8	46.4	3.8
	2013	11.4	10.6	4.6	S	31.1	79.8	3.1
	2014	13.0	11.3	6.1	S	30.8	45.4	3.6
	2015	14.8	11.7	4.9	S	27.9	46.4	3.2
	Avg	12.0	10.7	7.0	S	29.5	47.4	3.4

Sta	Year	Air temp (c)	Water temp (c)	Wind vel. (knots)	Wind dir	Salinity (ppt)	Water depth (f)	Secchi (m)
8	2002	12.1	10.3	11.8	SE	30.0	29.4	2.4
	2003	13.7	11.2	11.6	SE	28.1	28.9	3.1
	2004	10.8	11.0	9.1	SE	29.3	28.7	2.4
	2005	12.8	12.1	7.7	S	28.5	29.8	3.3
	2006	11.8	10.5	6.7	S	29.0	30.4	3.0
	2007	11.2	9.9	5.5	S	29.5	29.8	3.2
	2008	10.9	9.7	5.9	SW	29.2	29.9	3.7
	2009	11.6	10.5	5.9	S	31.2	29.6	3.4
	2010	11.7	10.2	5.2	SE	29.3	29.9	2.7
	2011	12.2	10.3	3.8	S	29.8	29.6	3.2
	2012	10.8	10.0	4.8	SE	28.6	30.4	3.2
	2013	17.7	10.5	4.8	S	30.7	55.2	2.8
	2014	13.2	11.3	6.3	S	30.8	31.5	3.5
	2015	15.2	11.6	5.8	S	27.7	30.1	2.6
	Avg	12.5	10.7	6.8	S	29.4	31.6	3.0

Appendix A7.–Yearly mean values for selected chemical and physical variables collected during the southern offshore test fishery project, 1979–2015.

Year	Air temp. (c)	Water temp. (c)	Wind vel. (knots)	Salinity (ppt)	Secchi (m)
1979	12.4	12.2	5.9	25.0	5.7
1980	12.4	10.0	8.2	24.8	4.2
1981	13.4	11.0	10.1	23.1	4.1
1982	12.0	8.5	9.0	20.3	5.0
1983	14.9	10.9	9.4	20.6	4.7
1984	13.5	10.8	9.1	–	5.3
1985	10.8	8.2	9.2	28.0	5.5
1986	10.6	9.1	8.2	–	5.4
1987	12.6	10.1	4.1	28.4	5.1
1988	14.2	9.1	8.9	30.2	4.7
1989	13.1	10.0	4.4	27.7	4.7
1990	12.3	11.4	8.5	21.3	4.6
1991	10.9	9.9	6.6	–	4.1
1992	12.0	11.1	5.4	28.4	4.3
1993	13.5	10.5	6.9	26.2	5.0
1994	13.0	10.0	9.3	29.0	6.0
1995	13.1	9.5	7.9	26.5	4.6
1996	12.6	10.0	9.1	30.8	4.7
1997	13.8	10.5	10.0	30.6	4.0
1998	12.5	10.3	8.3	30.0	5.4
1999	13.4	10.3	12.4	30.2	4.5
2000	13.5	10.5	12.2	30.1	5.2
2001	12.9	10.7	10.7	30.1	5.2
2002	12.5	10.1	13.0	30.4	4.5
2003	14.2	11.3	12.9	29.6	5.0
2004	10.7	10.4	8.5	30.0	4.7
2005	13.0	11.7	7.1	29.4	5.0
2006	11.3	10.3	7.2	28.4	4.6
2007	11.0	9.4	5.5	30.2	5.3
2008	10.5	9.3	6.3	29.7	5.3
2009	11.4	10.0	6.1	31.8	4.7
2010	11.2	9.9	5.8	30.1	4.7
2011	11.5	9.8	3.9	30.4	5.1
2012	11.0	9.6	5.1	29.4	5.5
2013	11.0	12.5	5.5	31.0	4.7
2014	12.8	10.9	6.1	31.4	4.9
1992– 2014 Avg	12.3	10.4	8.1	29.7	4.9
2015	15.0	11.3	4.6	29.1	4.7

APPENDIX B: HISTORIC GENETIC STOCK IDENTIFICATION DATA

Appendix B1.–Reporting group stock composition estimates (Proportion), standard deviations (SD), 90% credibility intervals (CI), sample size (n), and effective sample size (n_{eff}) for temporally grouped mixtures (Date ranges) of sockeye salmon captured in the southern OTF from 2006–2014.

Date Range	n; n_{eff}	Reporting Group	Stock composition: Within date range: Proportion	SD	90% CI 5%	90% CI 95%		Stock-specific CCPUE: Within date range: Estimate	SD	90% CI 5%	90% CI 95%	Within year Proportion
						2006						
7/1–9	n=325	Crescent	0.04	0.01	0.02	0.06		11	3	5	16	0.01
	n_{eff}=325	West	0.06	0.02	0.03	0.09		16	5	8	24	0.01
		JCL	0.01	0.01	0.00	0.02		3	3	0	5	0.00
		SusYen	0.05	0.02	0.02	0.08		13	5	5	21	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.03	0.01	0.01	0.06		8	3	3	16	0.01
		Kenai	0.30	0.04	0.24	0.36		79	11	63	95	0.06
		Kasilof	0.51	0.04	0.45	0.57		134	11	119	150	0.11
							$CCPUE_i$	263				
7/10–16	n=266	Crescent	0.00	0.00	0.00	0.01		0	1	0	2	0.00
	n_{eff}=263	West	0.11	0.04	0.06	0.18		26	9	14	43	0.02
		JCL	0.06	0.02	0.03	0.09		14	4	8	22	0.01
		SusYen	0.11	0.04	0.04	0.18		27	10	10	43	0.02
		Fish	0.00	0.00	0.00	0.01		0	1	0	2	0.00
		KTNE	0.05	0.02	0.02	0.09		12	5	5	21	0.01
		Kenai	0.33	0.04	0.27	0.39		79	9	64	93	0.06
		Kasilof	0.33	0.04	0.27	0.39		78	9	64	93	0.06
							$CCPUE_i$	237				
7/17–23	n=401	Crescent	0.02	0.01	0.00	0.04		8	4	0	15	0.01
	n_{eff}=397	West	0.07	0.02	0.05	0.10		25	5	17	34	0.02
		JCL	0.05	0.02	0.03	0.08		16	5	9	26	0.01
		SusYen	0.07	0.02	0.04	0.11		25	7	13	37	0.02
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.02	0.01	0.01	0.03		6	3	2	11	0.00
		Kenai	0.60	0.03	0.55	0.66		209	11	191	227	0.16
		Kasilof	0.17	0.03	0.13	0.21		57	9	43	72	0.04
							$CCPUE_i$	346				
7/24–8/1	n=393	Crescent	0.00	0.00	0.00	0.01		0	2	0	3	0.00
	n_{eff}=391	West	0.07	0.02	0.04	0.11		32	9	17	47	0.03
		JCL	0.05	0.01	0.03	0.08		23	6	14	33	0.02
		SusYen	0.02	0.02	0.00	0.05		9	7	2	24	0.01
		Fish	0.00	0.00	0.00	0.00		0	1	0	0	0.00
		KTNE	0.03	0.02	0.01	0.06		13	7	4	26	0.01
		Kenai	0.70	0.03	0.65	0.75		301	13	280	322	0.24
		Kasilof	0.12	0.02	0.09	0.16		53	10	38	69	0.04
							$CCPUE_i$	431				
							$CCPUE_f$	1,277				

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			Stock composition				Stock-specific CCPUE					
			Within date range				Within date range					Within year
Date		Reporting			90% CI					90% CI		
Range	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
						2007						
7/1–9	n=374	Crescent	0.08	0.02	0.05	0.12		24	6	16	34	0.01
	n_{eff}=372	West	0.16	0.03	0.11	0.22		48	10	32	64	0.02
		JCL	0.03	0.01	0.02	0.05		9	3	5	14	0.00
		SusYen	0.03	0.01	0.01	0.05		8	3	4	14	0.00
		Fish	0.02	0.01	0.00	0.03		5	3	0	10	0.00
		KTNE	0.05	0.02	0.02	0.09		16	6	7	27	0.01
		Kenai	0.39	0.03	0.34	0.45		115	10	99	131	0.05
		Kasilof	0.23	0.03	0.19	0.28		68	9	54	83	0.03
							$CCPUE_i$	293				
7/10–13	n=444	Crescent	0.03	0.01	0.02	0.06		16	5	8	25	0.01
	n_{eff}=437	West	0.08	0.02	0.04	0.11		35	10	19	51	0.01
		JCL	0.05	0.01	0.03	0.07		21	5	13	30	0.01
		SusYen	0.10	0.02	0.07	0.14		46	10	31	63	0.02
		Fish	0.01	0.01	0.00	0.02		3	3	0	10	0.00
		KTNE	0.03	0.01	0.01	0.05		13	5	6	22	0.01
		Kenai	0.53	0.03	0.47	0.59		239	15	214	265	0.10
		Kasilof	0.17	0.03	0.13	0.22		78	13	57	99	0.03
							$CCPUE_i$	451				
7/14–18	n=404	Crescent	0.04	0.01	0.02	0.06		28	8	16	43	0.01
	n_{eff}=399	West	0.02	0.01	0.01	0.05		16	9	6	33	0.01
		JCL	0.07	0.02	0.05	0.10		48	12	31	69	0.02
		SusYen	0.11	0.03	0.06	0.15		72	19	41	103	0.03
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.03	0.01	0.01	0.05		19	7	9	31	0.01
		Kenai	0.61	0.03	0.56	0.66		409	21	373	443	0.16
		Kasilof	0.12	0.02	0.08	0.16		80	16	55	106	0.03
							$CCPUE_i$	672				
7/19–23	n=429	Crescent	0.05	0.01	0.04	0.08		29	7	18	41	0.01
	n_{eff}=427	West	0.02	0.01	0.01	0.04		13	6	6	23	0.01
		JCL	0.04	0.01	0.03	0.07		23	7	13	35	0.01
		SusYen	0.08	0.02	0.05	0.11		42	10	25	60	0.02
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.03	0.01	0.02	0.05		17	5	9	26	0.01
		Kenai	0.67	0.03	0.62	0.72		351	16	325	377	0.14
		Kasilof	0.10	0.02	0.06	0.13		50	12	32	70	0.02
							$CCPUE_i$	524				
7/24-8/2	n=429	Crescent	0.05	0.02	0.03	0.08		28	9	14	42	0.01
	n_{eff}=391	West	0.04	0.01	0.02	0.06		20	7	11	33	0.01
		JCL	0.05	0.01	0.03	0.08		29	7	19	41	0.01
		SusYen	0.06	0.02	0.03	0.09		32	10	18	49	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.02	0.01	0.00	0.04		11	7	1	24	0.00
		Kenai	0.69	0.03	0.64	0.74		376	16	349	402	0.15
		Kasilof	0.09	0.02	0.06	0.13		50	11	32	69	0.02
							$CCPUE_i$	545				
							$CCPUE_f$	2,485				

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Date Range	n; n_{eff}	Reporting Group	Stock composition: Within date range: Proportion	SD	90% CI 5%	95%		Stock-specific CCPUE: Within date range: Estimate	SD	90% CI 5%	95%	Within year Proportion
						2008						
7/1–7	n=422	Crescent	0.03	0.01	0.02	0.05		17	6	8	28	0.01
	n_{eff}=418	West	0.11	0.02	0.07	0.15		55	12	37	76	0.04
		JCL	0.05	0.01	0.04	0.08		28	6	18	39	0.02
		SusYen	0.04	0.02	0.02	0.08		23	10	8	40	0.01
		Fish	0.01	0.01	0.00	0.03		7	4	2	13	0.00
		KTNE	0.03	0.01	0.02	0.05		16	5	8	26	0.01
		Kenai	0.27	0.03	0.22	0.32		139	15	115	165	0.09
		Kasilof	0.45	0.03	0.40	0.50		236	16	209	262	0.15
							$CCPUE_i$	520				
7/8–12	n=465	Crescent	0.04	0.01	0.02	0.06		15	5	8	23	0.01
	n_{eff}=457	West	0.12	0.02	0.09	0.16		47	8	33	61	0.03
		JCL	0.07	0.01	0.05	0.10		29	6	20	38	0.02
		SusYen	0.10	0.02	0.07	0.14		41	7	29	53	0.03
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.01	0.01	0.00	0.02		2	3	0	8	0.00
		Kenai	0.43	0.03	0.39	0.48		167	11	149	186	0.11
		Kasilof	0.22	0.02	0.18	0.26		86	9	71	102	0.06
							$CCPUE_i$	387				
7/13–17	n=436	Crescent	0.05	0.01	0.03	0.07		17	4	10	24	0.01
	n_{eff}=429	West	0.13	0.02	0.09	0.16		42	7	31	55	0.03
		JCL	0.10	0.02	0.07	0.14		34	7	24	46	0.02
		SusYen	0.05	0.02	0.01	0.09		17	8	4	30	0.01
		Fish	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		KTNE	0.03	0.01	0.01	0.05		9	3	5	15	0.01
		Kenai	0.49	0.03	0.44	0.54		165	10	147	182	0.11
		Kasilof	0.15	0.02	0.11	0.19		49	8	37	62	0.03
							$CCPUE_i$	333				
7/18–31	n=438	Crescent	0.03	0.01	0.01	0.05		9	3	4	15	0.01
	n_{eff}=426	West	0.13	0.02	0.10	0.16		40	5	31	49	0.03
		JCL	0.06	0.01	0.04	0.08		19	4	13	27	0.01
		SusYen	0.04	0.01	0.02	0.06		13	4	7	20	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.02	0.01	0.01	0.03		5	2	2	9	0.00
		Kenai	0.58	0.03	0.54	0.63		184	9	169	199	0.12
		Kasilof	0.14	0.02	0.11	0.18		45	7	34	57	0.03
							$CCPUE_i$	315				
							$CCPUE_f$	1,555				

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Date Range	n; n_{eff}	Reporting Group	Stock composition, Within date range: Proportion	SD	90% CI 5%	95%		Stock-specific CCPUE, Within date range: Estimate	SD	90% CI 5%	95%	Within year Proportion
						2009						
7/1–5	n=401	Crescent	0.02	0.01	0.00	0.04		7	4	0	14	0.00
	n_{eff}=392	West	0.24	0.03	0.20	0.28		76	8	63	90	0.03
		JCL	0.02	0.01	0.01	0.04		8	3	3	13	0.00
		SusYen	0.00	0.00	0.00	0.01		1	2	0	4	0.00
		Fish	0.03	0.01	0.02	0.05		10	3	5	16	0.00
		KTNE	0.04	0.01	0.02	0.06		14	4	8	21	0.01
		Kenai	0.33	0.03	0.28	0.38		105	10	88	122	0.05
		Kasilof	0.31	0.03	0.26	0.36		98	10	81	115	0.04
							$CCPUE_i$	318				
7/6–9	n=445	Crescent	0.04	0.01	0.02	0.07		19	6	11	29	0.01
	n_{eff}=431	West	0.18	0.03	0.13	0.22		76	11	58	95	0.03
		JCL	0.03	0.02	0.00	0.06		13	7	2	25	0.01
		SusYen	0.09	0.03	0.05	0.14		39	12	20	60	0.02
		Fish	0.01	0.01	0.00	0.03		5	4	0	12	0.00
		KTNE	0.04	0.01	0.02	0.06		17	5	9	25	0.01
		Kenai	0.33	0.03	0.28	0.38		143	14	120	166	0.06
		Kasilof	0.28	0.03	0.23	0.33		122	13	101	143	0.06
							$CCPUE_i$	433				
7/10–13	n=407	Crescent	0.07	0.02	0.04	0.10		28	7	18	39	0.01
	n_{eff}=398	West	0.20	0.03	0.15	0.25		80	12	62	102	0.04
		JCL	0.05	0.02	0.03	0.08		20	6	11	31	0.01
		SusYen	0.09	0.03	0.04	0.14		36	11	18	55	0.02
		Fish	0.01	0.01	0.00	0.03		5	3	0	11	0.00
		KTNE	0.03	0.01	0.01	0.05		12	4	5	19	0.01
		Kenai	0.48	0.03	0.43	0.53		195	13	175	216	0.09
		Kasilof	0.07	0.02	0.04	0.10		29	8	17	42	0.01
							$CCPUE_i$	404				
7/14–16	n=406	Crescent	0.07	0.02	0.04	0.10		29	7	19	41	0.01
	n_{eff}=395	West	0.13	0.02	0.09	0.16		53	9	39	68	0.02
		JCL	0.03	0.01	0.01	0.05		12	4	6	19	0.01
		SusYen	0.06	0.02	0.04	0.09		27	7	16	39	0.01
		Fish	0.01	0.01	0.00	0.03		5	3	0	11	0.00
		KTNE	0.02	0.01	0.01	0.03		8	4	3	15	0.00
		Kenai	0.63	0.03	0.58	0.68		262	13	242	283	0.12
		Kasilof	0.05	0.02	0.03	0.08		23	7	12	34	0.01
							$CCPUE_i$	419				
7/17–22	n=406	Crescent	0.07	0.02	0.05	0.10		27	6	18	38	0.01
	n_{eff}=397	West	0.10	0.03	0.06	0.15		35	10	22	54	0.02
		JCL	0.02	0.01	0.01	0.04		8	4	2	16	0.00
		SusYen	0.07	0.03	0.02	0.11		24	9	9	39	0.01
		Fish	0.01	0.01	0.00	0.02		3	3	0	8	0.00
		KTNE	0.02	0.01	0.01	0.04		8	3	3	14	0.00
		Kenai	0.67	0.03	0.62	0.72		243	11	224	261	0.11
		Kasilof	0.04	0.02	0.01	0.07		15	7	5	27	0.01
							$CCPUE_i$	363				

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			Stock composition					Stock-specific CCPUE				
			Within date range					Within date range				Within year
					90% CI					90% CI		
Date Range	n; n_{eff}	Reporting Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
2009												
7/23–30	n=402	Crescent	0.05	0.02	0.03	0.08		14	4	8	21	0.01
	n_{eff}=324	West	0.12	0.02	0.09	0.16		33	5	24	42	0.01
		JCL	0.04	0.01	0.02	0.06		10	3	4	16	0.00
		SusYen	0.02	0.01	0.01	0.05		6	3	2	13	0.00
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.03	0.01	0.01	0.05		8	3	3	14	0.00
		Kenai	0.72	0.03	0.67	0.77		191	8	178	204	0.09
		Kasilof	0.01	0.02	0.00	0.04		3	4	0	11	0.00
							$CCPUE_i$	266				
							$CCPUE_f$	2,204				
2010												
7/1–4	n=358	Crescent	0.05	0.01	0.03	0.07		17	5	10	25	0.01
	n_{eff}=357	West	0.16	0.02	0.11	0.20		56	9	41	71	0.03
		JCL	0.03	0.01	0.01	0.04		9	3	5	15	0.01
		SusYen	0.03	0.01	0.01	0.06		12	5	5	20	0.01
		Fish	0.09	0.02	0.07	0.12		34	6	25	44	0.02
		KTNE	0.05	0.01	0.03	0.07		17	5	10	26	0.01
		Kenai	0.46	0.03	0.41	0.51		166	10	149	183	0.09
		Kasilof	0.14	0.02	0.11	0.17		49	7	38	61	0.03
							$CCPUE_i$	360				
7/5–10	n=464	Crescent	0.02	0.01	0.01	0.03		6	3	2	11	0.00
	n_{eff}=464	West	0.17	0.02	0.14	0.21		68	8	55	81	0.04
		JCL	0.04	0.01	0.02	0.05		15	4	9	21	0.01
		SusYen	0.05	0.01	0.03	0.07		19	5	11	27	0.01
		Fish	0.06	0.01	0.04	0.08		24	4	17	32	0.01
		KTNE	0.05	0.01	0.03	0.07		19	4	12	27	0.01
		Kenai	0.50	0.02	0.45	0.54		194	10	177	210	0.11
		Kasilof	0.12	0.02	0.09	0.15		46	6	36	57	0.02
							$CCPUE_i$	390				
7/11–16	n=448	Crescent	0.03	0.01	0.02	0.04		12	3	7	18	0.01
	n_{eff}=448	West	0.13	0.02	0.10	0.16		55	7	44	67	0.03
		JCL	0.03	0.01	0.02	0.04		12	3	7	18	0.01
		SusYen	0.04	0.01	0.02	0.05		15	4	8	23	0.01
		Fish	0.01	0.01	0.01	0.03		6	3	2	11	0.00
		KTNE	0.04	0.01	0.02	0.05		15	4	9	22	0.01
		Kenai	0.68	0.02	0.64	0.72		284	10	267	300	0.15
		Kasilof	0.05	0.01	0.03	0.07		21	5	14	29	0.01
							$CCPUE_i$	419				
7/17–23	n=390	Crescent	0.04	0.01	0.02	0.06		11	3	6	17	0.01
	n_{eff}=389	West	0.12	0.02	0.10	0.15		38	6	29	47	0.02
		JCL	0.05	0.01	0.03	0.07		16	4	10	22	0.01
		SusYen	0.03	0.01	0.02	0.05		11	3	6	17	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.03	0.01	0.01	0.04		8	3	4	13	0.00
		Kenai	0.71	0.02	0.67	0.75		218	7	205	230	0.12
		Kasilof	0.02	0.01	0.01	0.04		6	2	3	11	0.00

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Date Range	n; n_{eff}	Reporting Group	Stock composition: Within date range: Proportion	SD	90% CI 5%	95%		Stock-specific CCPUE: Within date range: Estimate	SD	90% CI 5%	95%	Within Proportion
						2010						
7/24–29	n=426	Crescent	0.03	0.01	0.02	0.05		12	3	7	18	0.01
	n_{eff}=426	West	0.11	0.02	0.09	0.14		41	6	32	52	0.02
		JCL	0.02	0.01	0.01	0.03		7	2	3	11	0.00
		SusYen	0.02	0.01	0.01	0.03		6	3	3	11	0.00
		Fish	0.00	0.00	0.00	0.01		1	1	0	3	0.00
		KTNE	0.01	0.01	0.00	0.02		4	2	1	7	0.00
		Kenai	0.78	0.02	0.74	0.81		284	8	271	297	0.15
		Kasilof	0.03	0.01	0.01	0.04		10	3	5	15	0.01
							$CCPUE_i$	365				
							$CCPUE_f$	1,842				
						2011						
7/1–13	n=453	Crescent	0.04	0.01	0.03	0.06		47	12	29	69	0.01
	n_{eff}=449	West	0.22	0.02	0.19	0.26		249	24	211	289	0.07
		JCL	0.03	0.01	0.02	0.05		36	10	21	53	0.01
		SusYen	0.08	0.02	0.06	0.11		95	18	66	126	0.03
		Fish	0.03	0.01	0.02	0.05		36	9	22	52	0.01
		KTNE	0.02	0.01	0.01	0.04		27	10	13	45	0.01
		Kenai	0.48	0.02	0.44	0.52		544	28	498	590	0.15
		Kasilof	0.08	0.01	0.06	0.11		92	15	68	119	0.02
							$CCPUE_i$	1,126				
7/14–18	n=428	Crescent	0.03	0.01	0.02	0.04		32	10	18	50	0.01
	n_{eff}=423	West	0.13	0.02	0.10	0.16		148	19	117	180	0.04
		JCL	0.02	0.01	0.01	0.04		25	9	12	41	0.01
		SusYen	0.04	0.01	0.02	0.06		44	12	26	66	0.01
		Fish	0.02	0.01	0.01	0.03		22	8	11	36	0.01
		KTNE	0.02	0.01	0.01	0.04		24	9	10	40	0.01
		Kenai	0.72	0.02	0.68	0.76		830	26	786	872	0.22
		Kasilof	0.02	0.01	0.01	0.04		27	9	14	43	0.01
							$CCPUE_i$	1,152				
7/19–24	n=383	Crescent	0.02	0.01	0.01	0.03		15	6	7	26	0.00
	n_{eff}=382	West	0.15	0.02	0.12	0.18		120	15	96	146	0.03
		JCL	0.00	0.00	0.00	0.01		3	3	0	9	0.00
		SusYen	0.04	0.01	0.02	0.06		30	9	16	46	0.01
		Fish	0.00	0.00	0.00	0.01		3	3	0	8	0.00
		KTNE	0.01	0.01	0.00	0.02		7	4	1	15	0.00
		Kenai	0.76	0.02	0.72	0.80		609	19	577	639	0.16
		Kasilof	0.02	0.01	0.01	0.04		17	7	7	30	0.00
							$CCPUE_i$	803				
7/25–30	n=387	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=387	West	0.15	0.02	0.12	0.18		96	12	77	116	0.03
		JCL	0.02	0.01	0.01	0.03		10	4	4	18	0.00
		SusYen	0.04	0.01	0.02	0.06		27	7	16	40	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		Kenai	0.78	0.02	0.74	0.81		493	14	470	516	0.13
		Kasilof	0.01	0.01	0.00	0.03		8	4	3	16	0.00
							$CCPUE_i$	634				
							$CCPUE_f$	3,715				

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2012												
			Stock composition				Stock-specific CCPUE					
			Within date range				Within date range					Within year
Date		Reporting			90% CI					90% CI		
Range	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
7/1–6	n=385	Crescent	0.03	0.01	0.01	0.04		8	3	4	13	0.00
	n_{eff}=381	West	0.18	0.02	0.15	0.22		57	7	46	68	0.03
		JCL	0.03	0.01	0.02	0.05		10	3	6	16	0.01
		SusYen	0.04	0.01	0.02	0.06		11	4	6	17	0.01
		Fish	0.01	0.00	0.00	0.01		2	1	0	4	0.00
		KTNE	0.01	0.00	0.00	0.01		2	1	0	5	0.00
		Kenai	0.62	0.03	0.58	0.66		190	8	177	203	0.10
		Kasilof	0.09	0.02	0.06	0.11		26	5	19	34	0.01
							$CCPUE_i$	306				
7/7–11	n=386	Crescent	0.03	0.01	0.01	0.04		9	3	5	15	0.00
	n_{eff}=378	West	0.12	0.02	0.09	0.16		42	7	32	54	0.02
		JCL	0.03	0.01	0.02	0.05		10	3	6	16	0.01
		SusYen	0.04	0.01	0.02	0.06		13	4	7	20	0.01
		Fish	0.01	0.00	0.00	0.01		2	1	0	4	0.00
		KTNE	0.00	0.00	0.00	0.01		1	1	0	3	0.00
		Kenai	0.73	0.02	0.69	0.77		249	8	235	262	0.13
		Kasilof	0.05	0.01	0.03	0.07		15	4	9	23	0.01
							$CCPUE_i$	342				
7/12–16	n=391	Crescent	0.01	0.01	0.00	0.02		5	3	1	10	0.00
	n_{eff}=384	West	0.08	0.01	0.06	0.10		34	6	25	44	0.02
		JCL	0.03	0.01	0.02	0.05		13	4	7	20	0.01
		SusYen	0.05	0.01	0.03	0.07		20	5	12	30	0.01
		Fish	0.00	0.00	0.00	0.01		1	1	0	3	0.00
		KTNE	0.01	0.00	0.00	0.01		2	2	0	6	0.00
		Kenai	0.79	0.02	0.75	0.83		335	9	319	350	0.17
		Kasilof	0.03	0.01	0.02	0.05		13	4	7	21	0.01
							$CCPUE_i$	424				
7/17–19	n=356	Crescent	0.00	0.00	0.00	0.01		2	2	0	5	0.00
	n_{eff}=354	West	0.05	0.01	0.03	0.07		21	5	13	30	0.01
		JCL	0.05	0.01	0.03	0.07		20	5	12	28	0.01
		SusYen	0.02	0.01	0.00	0.03		6	4	1	13	0.00
		Fish	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		KTNE	0.01	0.01	0.00	0.03		6	3	2	11	0.00
		Kenai	0.84	0.02	0.80	0.87		349	9	334	363	0.18
		Kasilof	0.03	0.01	0.02	0.05		13	4	7	21	0.01
							$CCPUE_i$	417				
7/20–30	n=470	Crescent	0.01	0.00	0.00	0.02		4	2	1	8	0.00
	n_{eff}=461	West	0.06	0.01	0.04	0.08		27	5	19	37	0.01
		JCL	0.02	0.01	0.01	0.04		10	3	6	16	0.01
		SusYen	0.03	0.01	0.01	0.05		14	6	5	23	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.01	0.01	0.00	0.02		4	3	1	9	0.00
		Kenai	0.87	0.02	0.84	0.90		396	8	382	408	0.20
		Kasilof	0.00	0.00	0.00	0.01		1	1	0	4	0.00
							$CCPUE_i$	455				
							$CCPUE_f$	1,944				

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Date Range	n; n_{eff}	Reporting Group	Stock composition: Within date range: Proportion	SD	90% CI 5%	90% CI 95%		Stock-specific CCPUE: Within date range: Estimate	SD	90% CI 5%	90% CI 95%	Within year: Proportion
2013												
All season	n=400	Crescent	0.01	0.01	0.00	0.03		18	9	6	34	0.01
	n_{eff}=393	West	0.10	0.02	0.07	0.13		136	23	101	175	0.10
		JCL	0.05	0.01	0.03	0.07		63	15	41	89	0.05
		SusYen	0.05	0.01	0.03	0.08		72	19	44	105	0.05
		Fish	0.00	0.00	0.00	0.01		3	3	0	10	0.00
		KTNE	0.02	0.01	0.01	0.04		31	12	14	52	0.02
		Kenai	0.71	0.02	0.67	0.75		953	33	898	1,006	0.71
		Kasilof	0.05	0.01	0.03	0.07		66	15	42	93	0.05
							$CCPUE_i$	1,342				
							$CCPUE_f$	1,342				
2014												
All	n=400	Crescent	0.04	0.02	0.02	0.08		111	44	46	189	0.04
	n_{eff}=396	West	0.11	0.03	0.07	0.17		287	73	177	414	0.11
		JCL	0.03	0.01	0.01	0.05		69	31	23	123	0.03
		SusYen	0.07	0.03	0.02	0.12		178	80	39	308	0.07
		Fish	0.00	0.00	0.00	0.00		0	3	0	0	0.00
		KTNE	0.02	0.01	0.01	0.04		49	23	18	90	0.02
		Kenai	0.68	0.04	0.61	0.75		1,711	109	1,532	1,891	0.68
		Kasilof	0.04	0.02	0.00	0.08		99	62	0	202	0.04
							$CCPUE_i$	2,505				
							$CCPUE_f$	2,505				

Note: Effective sample size (n_{eff}) is the number of samples successfully screened from each stratum after excluding individuals with <80% of all markers that could be scored. Proportions for a given mixture may not sum to 1 due to rounding error. The 90% Credibility intervals may not include the point estimate for the very low CCPUE estimates because fewer than 5% of iterations had values above zero. Original genetic stock composition estimates are multiplied by the CCPUE within date ranges and these estimates are divided by the total annual CCPUE (Total CCPUE) for the second set of within year proportions. Stock-specific CCPUE is derived using non-interpolated CCPUE values.

Appendix B2.–Reporting group stock composition estimates (Proportion), standard deviations (SD), 90% credibility intervals (CI), sample size (n), and effective sample size (n_{eff}) for spatially grouped mixtures (Stations) of sockeye salmon captured in the southern OTF from 2010–2012.

			Stock composition					Stock-specific CCPUE				
			Within station					Within station				Within year
		Reporting			90% CI					90% CI		
Station	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	0	1	Proportion
						2010						
4	n=222	Crescent	0.05	0.02	0.03	0.08		8	3	4	13	0.00
	n_{eff}=222	West	0.10	0.02	0.06	0.14		16	4	10	23	0.01
		JCL	0.04	0.01	0.02	0.06		6	2	3	10	0.00
		SusYen	0.04	0.02	0.02	0.07		7	3	3	12	0.00
		Fish	0.04	0.01	0.02	0.06		6	2	3	10	0.00
		KTNE	0.03	0.01	0.01	0.06		6	2	2	10	0.00
		Kenai	0.63	0.03	0.58	0.69		105	6	96	114	0.06
		Kasilof	0.07	0.02	0.04	0.10		11	3	7	17	0.01
							$CCPUE_i$	166				
5	n=296	Crescent	0.02	0.01	0.01	0.03		5	2	2	9	0.00
	n_{eff}=296	West	0.10	0.02	0.07	0.14		29	6	21	39	0.02
		JCL	0.02	0.01	0.01	0.03		5	2	2	10	0.00
		SusYen	0.04	0.01	0.02	0.06		11	4	5	17	0.01
		Fish	0.02	0.01	0.01	0.04		7	3	3	11	0.00
		KTNE	0.04	0.01	0.02	0.06		10	3	5	16	0.01
		Kenai	0.69	0.03	0.64	0.74		195	8	182	208	0.11
		Kasilof	0.07	0.02	0.05	0.10		21	4	14	29	0.01
							$CCPUE_i$	282				
6	n=487	Crescent	0.02	0.01	0.01	0.03		8	3	4	13	0.00
	n_{eff}=486	West	0.13	0.02	0.11	0.16		55	7	44	66	0.03
		JCL	0.04	0.01	0.03	0.06		17	4	11	24	0.01
		SusYen	0.04	0.01	0.02	0.06		17	4	10	24	0.01
		Fish	0.05	0.01	0.03	0.07		20	4	14	27	0.01
		KTNE	0.03	0.01	0.02	0.05		13	3	8	20	0.01
		Kenai	0.63	0.02	0.59	0.66		262	10	245	277	0.14
		Kasilof	0.06	0.01	0.04	0.08		26	5	18	35	0.01
							$CCPUE_i$	417				
6.5	n=528	Crescent	0.01	0.01	0.00	0.02		6	2	2	10	0.00
	n_{eff}=528	West	0.15	0.02	0.12	0.18		66	8	54	79	0.04
		JCL	0.04	0.01	0.03	0.06		20	4	13	27	0.01
		SusYen	0.04	0.01	0.02	0.05		16	4	10	23	0.01
		Fish	0.04	0.01	0.02	0.05		16	4	10	22	0.01
		KTNE	0.03	0.01	0.02	0.04		12	3	7	18	0.01
		Kenai	0.64	0.02	0.60	0.67		284	10	267	300	0.15
		Kasilof	0.06	0.01	0.04	0.08		27	5	19	35	0.01
							$CCPUE_i$	445				
7	n=381	Crescent	0.05	0.01	0.03	0.07		18	5	11	26	0.01
	n_{eff}=380	West	0.15	0.02	0.12	0.19		59	8	46	73	0.03
		JCL	0.02	0.01	0.01	0.04		9	3	4	14	0.00
		SusYen	0.04	0.01	0.02	0.05		14	4	8	21	0.01
		Fish	0.02	0.01	0.01	0.04		9	3	5	15	0.00
		KTNE	0.03	0.01	0.02	0.05		13	4	7	20	0.01
		Kenai	0.60	0.03	0.56	0.65		237	11	219	254	0.13
		Kasilof	0.08	0.02	0.06	0.11		33	6	24	43	0.02
							$CCPUE_i$	392				

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Station	n; n_{eff}	Reporting Group	Stock composition: Within station: Proportion	SD	90% CI 5%	95%		Stock-specific CCPUE: Within station: Estimate	SD	90% CI 0	1	Within year: Proportion
						2010						
8	n=172	Crescent	0.09	0.02	0.05	0.13		12	3	7	18	0.01
	n_{eff}=172	West	0.15	0.03	0.10	0.21		21	5	14	29	0.01
		JCL	0.01	0.01	0.00	0.03		2	1	0	5	0.00
		SusYen	0.01	0.01	0.00	0.04		2	2	0	5	0.00
		Fish	0.03	0.01	0.01	0.06		4	2	2	8	0.00
		KTNE	0.05	0.02	0.02	0.09		8	3	3	13	0.00
		Kenai	0.58	0.04	0.52	0.65		81	6	72	90	0.04
		Kasilof	0.06	0.02	0.03	0.10		9	3	5	14	0.00
							$CCPUE_i$	139				
							$CCPUE_f$	1,842				
						2011						
4	n=130	Crescent	0.00	0.01	0.00	0.02		1	1	0	3	0.00
	n_{eff}=128	West	0.11	0.03	0.07	0.16		22	6	14	32	0.01
		JCL	0.02	0.01	0.01	0.05		5	3	1	10	0.00
		SusYen	0.03	0.02	0.01	0.07		7	4	2	14	0.00
		Fish	0.02	0.01	0.01	0.05		5	3	1	10	0.00
		KTNE	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		Kenai	0.76	0.04	0.69	0.82		151	8	138	164	0.04
		Kasilof	0.04	0.02	0.02	0.08		9	4	3	16	0.00
							$CCPUE_i$	199				
5	n=256	Crescent	0.00	0.00	0.00	0.00		0	1	0	2	0.00
	n_{eff}=253	West	0.13	0.02	0.10	0.17		87	14	65	111	0.02
		JCL	0.03	0.01	0.01	0.05		19	7	8	32	0.01
		SusYen	0.07	0.02	0.04	0.11		47	12	29	68	0.01
		Fish	0.02	0.01	0.01	0.04		15	6	6	26	0.00
		KTNE	0.02	0.01	0.01	0.04		15	7	6	28	0.00
		Kenai	0.66	0.03	0.61	0.71		430	20	396	462	0.12
		Kasilof	0.06	0.02	0.04	0.09		38	10	23	56	0.01
							$CCPUE_i$	651				
6	n=428	Crescent	0.02	0.01	0.01	0.03		16	8	6	30	0.00
	n_{eff}=425	West	0.16	0.02	0.13	0.19		161	19	131	193	0.04
		JCL	0.01	0.01	0.01	0.02		15	6	6	26	0.00
		SusYen	0.05	0.01	0.03	0.07		50	12	31	72	0.01
		Fish	0.01	0.01	0.00	0.02		12	5	5	22	0.00
		KTNE	0.02	0.01	0.01	0.04		25	9	11	41	0.01
		Kenai	0.68	0.02	0.64	0.72		702	25	661	742	0.19
		Kasilof	0.04	0.01	0.03	0.06		45	11	28	65	0.01
							$CCPUE_i$	1,026				
6.5	n=349	Crescent	0.01	0.01	0.00	0.03		11	5	4	21	0.00
	n_{eff}=348	West	0.18	0.02	0.15	0.22		142	17	116	171	0.04
		JCL	0.03	0.01	0.01	0.04		20	7	10	33	0.01
		SusYen	0.04	0.01	0.02	0.06		33	9	19	50	0.01
		Fish	0.01	0.00	0.00	0.01		5	3	1	11	0.00
		KTNE	0.02	0.01	0.01	0.03		14	6	5	25	0.00
		Kenai	0.69	0.03	0.65	0.73		544	20	510	577	0.15
		Kasilof	0.03	0.01	0.01	0.04		20	7	10	33	0.01
							$CCPUE_i$	790				

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			Stock composition				Stock-specific CCPUE					
			Within station				Within station					Within year
		Reporting			90% CI					90% CI		
Station	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	0	1	Proportion
					2011							
7	n=343	Crescent	0.03	0.01	0.02	0.05		28	9	15	43	0.01
	n_{eff}=380	West	0.18	0.02	0.15	0.22		155	18	126	185	0.04
		JCL	0.02	0.01	0.01	0.03		16	7	7	29	0.00
		SusYen	0.04	0.01	0.02	0.07		37	11	20	57	0.01
		Fish	0.02	0.01	0.01	0.03		17	7	8	29	0.00
		KTNE	0.00	0.00	0.00	0.00		1	2	0	4	0.00
		Kenai	0.67	0.03	0.62	0.71		572	23	534	608	0.15
		Kasilof	0.04	0.01	0.02	0.05		30	9	17	47	0.01
							$CCPUE_i$	855				
8	n=145	Crescent	0.11	0.03	0.06	0.16		21	5	12	30	0.01
	n_{eff}=172	West	0.20	0.03	0.15	0.26		39	7	29	51	0.01
		JCL	0.01	0.01	0.00	0.02		1	1	0	4	0.00
		SusYen	0.05	0.02	0.02	0.09		10	4	4	17	0.00
		Fish	0.01	0.01	0.00	0.03		3	2	0	6	0.00
		KTNE	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		Kenai	0.61	0.04	0.54	0.68		118	8	104	132	0.03
		Kasilof	0.01	0.01	0.00	0.03		2	2	0	6	0.00
							$CCPUE_i$	194				
							$CCPUE_f$	3,715				
					2012							
4	n=196	Crescent	0.00	0.01	0.00	0.02		0	1	0	2	0.00
	n_{eff}=189	West	0.08	0.02	0.04	0.12		12	4	7	18	0.01
		JCL	0.03	0.01	0.01	0.05		4	2	2	8	0.00
		SusYen	0.03	0.02	0.01	0.06		4	2	1	9	0.00
		Fish	0.01	0.01	0.00	0.02		1	1	0	3	0.00
		KTNE	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		Kenai	0.83	0.03	0.78	0.88		131	5	123	139	0.07
		Kasilof	0.03	0.01	0.01	0.05		4	2	1	8	0.00
							$CCPUE_i$	158				
5	n=347	Crescent	0.00	0.00	0.00	0.01		0	1	0	2	0.00
	n_{eff}=340	West	0.08	0.02	0.06	0.11		24	5	17	33	0.01
		JCL	0.02	0.01	0.01	0.03		5	2	2	9	0.00
		SusYen	0.02	0.01	0.01	0.03		5	2	2	10	0.00
		Fish	0.01	0.00	0.00	0.02		2	1	0	5	0.00
		KTNE	0.01	0.01	0.00	0.03		4	2	1	8	0.00
		Kenai	0.83	0.02	0.79	0.87		246	6	235	256	0.13
		Kasilof	0.03	0.01	0.01	0.05		9	3	4	14	0.00
							$CCPUE_i$	296				
6	n=468	Crescent	0.01	0.00	0.00	0.02		4	3	1	9	0.00
	n_{eff}=464	West	0.11	0.02	0.08	0.13		57	8	44	71	0.03
		JCL	0.04	0.01	0.02	0.05		21	5	13	29	0.01
		SusYen	0.06	0.01	0.04	0.08		33	7	22	46	0.02
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.01	0.01	0.00	0.02		3	4	0	11	0.00
		Kenai	0.74	0.02	0.71	0.78		398	12	379	417	0.20
		Kasilof	0.04	0.01	0.02	0.05		20	5	12	29	0.01
							$CCPUE_i$	537				

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			Stock composition				Stock-specific CCPUE					
			Within station				Within station					Within year
		Reporting			90% CI					90% CI		
Station	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
						2012						
6.5	n=417	Crescent	0.01	0.01	0.00	0.02		5	3	2	10	0.00
	n_{eff}=410	West	0.12	0.02	0.09	0.15		49	8	37	62	0.03
		JCL	0.04	0.01	0.02	0.06		16	4	10	23	0.01
		SusYen	0.03	0.01	0.01	0.04		11	4	5	18	0.01
		Fish	0.00	0.00	0.00	0.01		1	2	0	4	0.00
		KTNE	0.01	0.01	0.00	0.03		4	3	0	11	0.00
		Kenai	0.76	0.02	0.72	0.80		320	10	304	335	0.16
		Kasilof	0.03	0.01	0.02	0.05		13	4	7	20	0.01
							$CCPUE_i$	419				
7	n=372	Crescent	0.01	0.01	0.00	0.03		5	3	1	10	0.00
	n_{eff}=371	West	0.09	0.02	0.06	0.12		36	6	26	47	0.02
		JCL	0.02	0.01	0.01	0.04		9	3	4	15	0.00
		SusYen	0.03	0.01	0.01	0.04		10	4	5	17	0.01
		Fish	0.00	0.00	0.00	0.01		1	1	0	4	0.00
		KTNE	0.00	0.00	0.00	0.01		1	1	0	4	0.00
		Kenai	0.80	0.02	0.76	0.83		319	9	305	334	0.16
		Kasilof	0.04	0.01	0.03	0.06		17	5	10	26	0.01
							$CCPUE_i$	400				
8	n=168	Crescent	0.09	0.02	0.05	0.13		12	3	7	17	0.01
	n_{eff}=165	West	0.15	0.03	0.10	0.20		20	4	14	27	0.01
		JCL	0.04	0.02	0.01	0.06		5	2	2	9	0.00
		SusYen	0.01	0.01	0.00	0.03		1	1	0	4	0.00
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.01	0.01	0.00	0.03		2	1	0	4	0.00
		Kenai	0.63	0.04	0.57	0.70		85	5	76	94	0.04
		Kasilof	0.07	0.02	0.04	0.11		10	3	5	15	0.00
							$CCPUE_i$	134				
							$CCPUE_f$	1,944				

Note: Effective sample size (n_{eff}) is the number of samples successfully screened from each stratum after excluding individuals with <80% of all markers that could be scored. Proportions for a given mixture may not sum to 1 due to rounding error. The 90% Credibility intervals may not include the point estimate for the very low CCPUE estimates because fewer than 5% of iterations had values above zero. Stock-specific CCPUE is derived using non-interpolated CCPUE values.

Appendix B3.–Reporting group stock composition estimates (Proportion), standard deviations (SD), 90% credibility intervals (CI), sample size (n), and effective sample size (n_{eff}) for temporally grouped mixtures (Date ranges) of sockeye salmon captured in the northern OTF for 2012–2014.

			Stock composition					Stock-specific CCPUE				
			Within date range					Within date range				Within year
Date		Reporting			90% CI					90% CI		
Range	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
						2012						
7/1–13	n=403	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=400	West	0.13	0.02	0.11	0.16		89	12	71	110	0.02
		JCL	0.04	0.01	0.02	0.05		24	7	14	36	0.01
		SusYen	0.04	0.01	0.02	0.06		26	7	15	39	0.01
		Fish	0.01	0.00	0.00	0.02		7	3	2	13	0.00
		KTNE	0.03	0.01	0.02	0.05		20	7	10	31	0.01
		Kenai	0.70	0.02	0.66	0.74		464	16	437	490	0.13
		Kasilof	0.05	0.01	0.04	0.08		36	8	24	50	0.01
							$CCPUE_i$	666				
7/14–16	n=545	Crescent	0.00	0.00	0.00	0.01		2	2	0	5	0.00
	n_{eff}=542	West	0.09	0.01	0.07	0.11		72	10	56	88	0.02
		JCL	0.08	0.01	0.06	0.10		61	9	47	77	0.02
		SusYen	0.07	0.01	0.05	0.10		58	10	43	75	0.02
		Fish	0.03	0.01	0.02	0.04		22	6	14	32	0.01
		KTNE	0.01	0.00	0.00	0.02		8	4	3	14	0.00
		Kenai	0.65	0.02	0.61	0.68		507	17	480	534	0.14
		Kasilof	0.07	0.01	0.05	0.09		52	9	38	67	0.01
							$CCPUE_i$	781				
7/17–19	n=529	Crescent	0.00	0.00	0.00	0.00		0	2	0	4	0.00
	n_{eff}=524	West	0.12	0.01	0.10	0.15		97	12	78	118	0.03
		JCL	0.05	0.01	0.04	0.07		42	8	30	56	0.01
		SusYen	0.03	0.01	0.02	0.05		27	8	14	42	0.01
		Fish	0.01	0.00	0.00	0.02		9	4	4	17	0.00
		KTNE	0.03	0.01	0.02	0.05		27	7	17	39	0.01
		Kenai	0.71	0.02	0.67	0.74		567	17	538	594	0.15
		Kasilof	0.04	0.01	0.03	0.06		34	8	22	47	0.01
							$CCPUE_i$	804				
7/20–22	n=483	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=480	West	0.06	0.01	0.04	0.08		43	10	29	60	0.01
		JCL	0.01	0.01	0.01	0.02		9	4	4	17	0.00
		SusYen	0.02	0.01	0.01	0.04		17	6	8	27	0.00
		Fish	0.00	0.00	0.00	0.01		2	2	0	5	0.00
		KTNE	0.01	0.01	0.00	0.02		9	4	3	17	0.00
		Kenai	0.86	0.02	0.83	0.89		645	13	623	666	0.17
		Kasilof	0.03	0.01	0.02	0.05		23	7	13	34	0.01
							$CCPUE_i$	748				
7/23–25	n=537	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=528	West	0.09	0.01	0.07	0.11		40	6	31	50	0.01
		JCL	0.03	0.01	0.02	0.04		13	3	8	19	0.00
		SusYen	0.03	0.01	0.02	0.05		14	4	8	21	0.00
		Fish	0.00	0.00	0.00	0.01		1	1	0	3	0.00
		KTNE	0.02	0.01	0.01	0.03		8	3	4	14	0.00
		Kenai	0.82	0.02	0.79	0.85		357	8	344	370	0.10
		Kasilof	0.01	0.00	0.00	0.02		4	2	1	8	0.00
							$CCPUE_i$	438				

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			Stock composition					Stock-specific CCPUE				
			Within date range					Within date range				Within year
Date		Reporting			90% CI					90% CI		
Range	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	0	1	Proportion
						2012						
7/26–30	n=357	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=356	West	0.04	0.01	0.02	0.05		9	3	5	14	0.00
		JCL	0.02	0.01	0.01	0.04		5	2	3	9	0.00
		SusYen	0.02	0.01	0.01	0.04		6	2	2	11	0.00
		Fish	0.00	0.00	0.00	0.01		1	1	0	2	0.00
		KTNE	0.01	0.00	0.00	0.02		2	1	0	4	0.00
		Kenai	0.88	0.02	0.85	0.91		231	5	223	238	0.06
		Kasilof	0.02	0.01	0.01	0.04		6	2	3	11	0.00
							$CCPUE_i$	261				
							$CCPUE_f$	3,696				
						2013						
7/1–13	n=435	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=421	West	0.14	0.02	0.12	0.18		48	6	39	59	0.02
		JCL	0.13	0.02	0.10	0.15		42	6	33	51	0.02
		SusYen	0.08	0.02	0.05	0.11		27	5	18	36	0.01
		Fish	0.00	0.00	0.00	0.01		1	1	0	3	0.00
		KTNE	0.06	0.01	0.04	0.08		19	5	12	27	0.01
		Kenai	0.55	0.03	0.51	0.60		186	9	172	200	0.07
		Kasilof	0.04	0.01	0.02	0.06		13	3	7	19	0.00
							$CCPUE_i$	335				
7/14–15	n=652	Crescent	0.00	0.00	0.00	0.00		0	1	0	0	0.00
	n_{eff}=630	West	0.12	0.01	0.10	0.15		177	21	143	213	0.07
		JCL	0.09	0.01	0.07	0.11		129	17	102	157	0.05
		SusYen	0.07	0.01	0.05	0.09		98	17	72	127	0.04
		Fish	0.00	0.00	0.00	0.01		4	3	0	10	0.00
		KTNE	0.03	0.01	0.01	0.04		37	11	21	57	0.01
		Kenai	0.67	0.02	0.64	0.70		963	29	915	1,010	0.37
		Kasilof	0.02	0.01	0.01	0.03		31	9	17	47	0.01
							$CCPUE_i$	1,438				
7/16–18	n=527	Crescent	0.00	0.00	0.00	0.01		1	2	0	4	0.00
	n_{eff}=522	West	0.05	0.01	0.04	0.07		27	6	18	37	0.01
		JCL	0.05	0.01	0.03	0.06		22	5	15	30	0.01
		SusYen	0.01	0.01	0.00	0.03		7	4	2	14	0.00
		Fish	0.00	0.00	0.00	0.01		2	1	0	5	0.00
		KTNE	0.01	0.00	0.00	0.02		4	2	1	8	0.00
		Kenai	0.85	0.02	0.82	0.88		420	8	406	433	0.16
		Kasilof	0.02	0.01	0.01	0.03		11	3	6	17	0.00
							$CCPUE_i$	494				

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			Stock composition					Stock-specific CCPUE				
			Within date range					Within date range				Within year
Date		Reporting			90% CI					90% CI		
Range	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	0	1	Proportion
						2013						
7/19–30	n=483	Crescent	0.00	0.00	0.00	0.00		0	0	0	1	0.00
	n_{eff}=480	West	0.10	0.02	0.07	0.12		31	5	23	39	0.01
		JCL	0.08	0.01	0.06	0.11		26	5	19	34	0.01
		SusYen	0.03	0.01	0.01	0.05		10	4	4	16	0.00
		Fish	0.00	0.00	0.00	0.01		1	1	0	3	0.00
		KTNE	0.02	0.01	0.01	0.04		7	3	3	12	0.00
		Kenai	0.75	0.02	0.71	0.79		235	7	223	247	0.09
		Kasilof	0.01	0.01	0.00	0.02		3	2	1	7	0.00
							$CCPUE_i$	313				
							$CCPUE_f$	2,580				
						2014						
7/1–7	n=431	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=423	West	0.21	0.04	0.14	0.27		78	15	53	102	0.04
		JCL	0.04	0.01	0.03	0.07		17	5	10	25	0.01
		SusYen	0.05	0.03	0.01	0.10		18	11	3	37	0.01
		Fish	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		KTNE	0.02	0.01	0.00	0.05		9	5	2	19	0.00
		Kenai	0.49	0.04	0.42	0.55		183	15	159	208	0.10
		Kasilof	0.19	0.03	0.14	0.24		71	11	54	89	0.04
							$CCPUE_i$	376				
7/8–15	n=420	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=415	West	0.15	0.03	0.11	0.21		57	11	41	78	0.03
		JCL	0.01	0.01	0.00	0.02		2	3	0	8	0.00
		SusYen	0.11	0.03	0.06	0.17		43	13	24	66	0.02
		Fish	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		KTNE	0.02	0.01	0.00	0.04		6	4	1	14	0.00
		Kenai	0.58	0.04	0.51	0.65		217	16	190	243	0.12
		Kasilof	0.13	0.03	0.09	0.18		50	10	34	67	0.03
							$CCPUE_i$	375				
7/16–20	n=417	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=408	West	0.18	0.03	0.14	0.22		63	9	48	79	0.04
		JCL	0.02	0.01	0.01	0.04		7	4	2	15	0.00
		SusYen	0.23	0.04	0.16	0.29		79	14	56	102	0.04
		Fish	0.00	0.01	0.00	0.02		1	3	0	8	0.00
		KTNE	0.03	0.02	0.01	0.06		9	6	3	21	0.01
		Kenai	0.45	0.04	0.38	0.52		156	15	132	180	0.09
		Kasilof	0.10	0.02	0.06	0.14		35	9	21	49	0.02
							$CCPUE_i$	350				
7/21–24	n=431	Crescent	0.00	0.00	0.00	0.00		0	1	0	0	0.00
	n_{eff}=421	West	0.11	0.02	0.07	0.14		44	9	31	59	0.02
		JCL	0.02	0.01	0.00	0.03		7	4	2	14	0.00
		SusYen	0.04	0.02	0.02	0.07		18	7	8	31	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.01	0.01	0.00	0.03		6	3	1	12	0.00
		Kenai	0.81	0.03	0.76	0.86		335	12	315	354	0.19
		Kasilof	0.01	0.01	0.00	0.03		3	5	0	14	0.00
							$CCPUE_i$	414				

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Date Range	n; n_{eff}	Reporting Group	Stock composition: Within date range: Proportion	SD	90% CI 5%	90% CI 95%		Stock-specific CCPUE: Within date range: Estimate	SD	90% CI 5%	90% CI 95%	Within year: Proportion
						2014						
7/25–30	n=301	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=296	West	0.14	0.03	0.09	0.20		38	8	25	53	0.02
		JCL	0.00	0.00	0.00	0.01		0	1	0	3	0.00
		SusYen	0.07	0.03	0.03	0.11		17	7	7	30	0.01
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.00	0.00	0.00	0.00		0	1	0	0	0.00
		Kenai	0.79	0.04	0.73	0.85		212	10	195	227	0.12
		Kasilof	0.00	0.00	0.00	0.00		0	1	0	0	0.00
							$CCPUE_i$	268				
							$CCPUE_f$	1,782				

Note: Effective sample size (n_{eff}) is the number of samples successfully screened from each stratum after excluding individuals with <80% of all markers that could be scored. Proportions for a given mixture may not sum to 1 due to rounding error. The 90% Credibility intervals may not include the point estimate for the very low CCPUE estimates because fewer than 5% of iterations had values above zero. Original genetic stock composition estimates are multiplied by the CCPUE within date ranges and these estimates are divided by the total annual CCPUE (Total CCPUE) for the second set of within year proportions. Stock-specific CCPUE is derived using non-interpolated CCPUE values.

Appendix B4.–Reporting group stock composition estimates (Proportion), standard deviations (SD), 90% credibility intervals (CI), sample size (n), and effective sample size (n_{eff}) for spatially grouped mixtures (Stations) of sockeye salmon captured in the northern OTF in 2012–2014.

			Stock composition				Stock-specific CCPUE					
			Within station				Within station					Within year
		Reporting			90% CI					90% CI		
Station	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
						2012						
1&2	n=459	Crescent	0.00	0.00	0.00	0.01		1	1	0	4	0.00
	n_{eff}=453	West	0.04	0.01	0.02	0.06		16	4	10	23	0.00
		JCL	0.01	0.01	0.00	0.02		5	2	2	8	0.00
		SusYen	0.01	0.01	0.01	0.03		6	3	2	10	0.00
		Fish	0.01	0.00	0.00	0.01		2	2	0	5	0.00
		KTNE	0.02	0.01	0.01	0.03		6	3	3	11	0.00
		Kenai	0.83	0.02	0.80	0.86		330	8	317	342	0.09
		Kasilof	0.08	0.01	0.06	0.11		33	6	24	43	0.01
							$CCPUE_i$	399				
3	n=797	Crescent	0.00	0.00	0.00	0.00		0	1	0	1	0.00
	n_{eff}=791	West	0.06	0.01	0.05	0.08		75	10	58	92	0.02
		JCL	0.02	0.01	0.02	0.03		27	6	18	39	0.01
		SusYen	0.05	0.01	0.03	0.06		56	10	40	74	0.02
		Fish	0.00	0.00	0.00	0.01		5	3	2	11	0.00
		KTNE	0.02	0.01	0.01	0.03		24	7	15	36	0.01
		Kenai	0.82	0.01	0.79	0.84		944	17	915	971	0.26
		Kasilof	0.02	0.01	0.01	0.03		25	7	15	37	0.01
							$CCPUE_i$	1,156				
4	n=1,109	Crescent	0.00	0.00	0.00	0.00		0	1	0	1	0.00
	n_{eff}=1098	West	0.07	0.01	0.05	0.08		104	12	85	124	0.03
		JCL	0.05	0.01	0.04	0.07		85	11	68	104	0.02
		SusYen	0.05	0.01	0.04	0.06		74	12	56	94	0.02
		Fish	0.02	0.00	0.01	0.02		25	6	16	36	0.01
		KTNE	0.02	0.00	0.01	0.03		30	7	19	42	0.01
		Kenai	0.76	0.01	0.74	0.78		1,179	21	1,144	1,213	0.32
		Kasilof	0.04	0.01	0.03	0.05		56	10	41	73	0.02
							$CCPUE_i$	1,554				
5	n=338	Crescent	0.00	0.00	0.00	0.00		0	1	0	1	0.00
	n_{eff}=337	West	0.24	0.02	0.20	0.28		89	9	75	104	0.02
		JCL	0.08	0.02	0.06	0.11		31	6	22	41	0.01
		SusYen	0.06	0.01	0.04	0.08		22	5	14	32	0.01
		Fish	0.02	0.01	0.01	0.03		6	3	2	10	0.00
		KTNE	0.02	0.01	0.01	0.04		9	4	3	15	0.00
		Kenai	0.55	0.03	0.51	0.60		207	11	190	224	0.06
		Kasilof	0.03	0.01	0.01	0.05		11	4	5	17	0.00
							$CCPUE_i$	375				

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Station	n; n_{eff}	Reporting Group	Stock composition Within station Proportion	SD	90% CI 5%	95%		Stock-specific CCPUE Within station Estimate	SD	90% CI 5%	95%	Within year Proportion
						2012						
6&7	n=151	Crescent	0.01	0.01	0.00	0.02		1	2	0	5	0.00
	n_{eff}=151	West	0.20	0.04	0.15	0.27		43	8	32	56	0.01
		JCL	0.02	0.01	0.00	0.04		3	2	1	8	0.00
		SusYen	0.00	0.01	0.00	0.01		0	1	0	2	0.00
		Fish	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		KTNE	0.01	0.01	0.00	0.04		3	3	0	8	0.00
		Kenai	0.72	0.04	0.66	0.79		154	8	140	167	0.04
		Kasilof	0.03	0.02	0.01	0.06		7	3	2	14	0.00
							$CCPUE_i$	212				
							$CCPUE_f$	3,696				
						2013[a]						
1&2	n=604	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=583	West	0.01	0.00	0.00	0.02		7	3	3	12	0.01
		JCL	0.02	0.01	0.01	0.03		14	4	8	21	0.00
		SusYen	0.02	0.01	0.01	0.03		10	4	4	17	0.00
		Fish	0.00	0.00	0.00	0.01		2	2	0	6	0.00
		KTNE	0.01	0.01	0.01	0.02		10	4	4	17	0.00
		Kenai	0.90	0.01	0.88	0.92		604	9	589	618	0.21
		Kasilof	0.03	0.01	0.02	0.05		21	5	13	31	0.02
							$CCPUE_i$	668				
3	n=621	Crescent	0.00	0.00	0.00	0.00		0	1	0	0	0.00
	n_{eff}=613	West	0.05	0.01	0.04	0.07		60	12	43	80	0.03
		JCL	0.06	0.01	0.05	0.08		69	11	52	88	0.01
		SusYen	0.03	0.01	0.02	0.04		32	9	18	48	0.02
		Fish	0.00	0.00	0.00	0.01		2	2	0	6	0.00
		KTNE	0.03	0.01	0.02	0.04		29	8	17	43	0.01
		Kenai	0.80	0.02	0.77	0.83		890	19	858	920	0.35
		Kasilof	0.02	0.01	0.01	0.04		27	8	15	41	0.01
							$CCPUE_i$	1,109				
4	n=495	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=480	West	0.14	0.02	0.11	0.17		75	9	60	91	0.01
		JCL	0.12	0.01	0.09	0.14		62	8	49	75	0.01
		SusYen	0.07	0.01	0.04	0.09		35	8	22	49	0.01
		Fish	0.00	0.00	0.00	0.01		1	1	0	4	0.00
		KTNE	0.04	0.01	0.03	0.06		23	6	15	33	0.00
		Kenai	0.62	0.02	0.58	0.65		329	13	308	349	0.16
		Kasilof	0.02	0.01	0.01	0.03		10	4	5	17	0.01
							$CCPUE_i$	535				
5	n=201	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=201	West	0.26	0.03	0.21	0.32		55	7	44	67	0.02
		JCL	0.27	0.03	0.22	0.32		57	7	46	69	0.01
		SusYen	0.23	0.03	0.18	0.29		49	7	38	61	0.00
		Fish	0.00	0.01	0.00	0.02		1	1	0	4	0.00
		KTNE	0.02	0.01	0.00	0.05		5	3	1	10	0.00
		Kenai	0.20	0.03	0.15	0.25		42	6	32	53	0.05
		Kasilof	0.01	0.01	0.00	0.03		2	2	0	5	0.00
							$CCPUE_i$	212				

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			Stock composition					Stock-specific CCPUE				
			Within station					Within station				Within year
		Reporting			90% CI					90% CI		
Station	n; n_{eff}	Group	Proportion	SD	5%	95%		Estimate	SD	5%	95%	Proportion
						2013[a]						
6&7	n=68	Crescent	0.06	0.03	0.01	0.13		3	2	1	7	0.00
	n_{eff}=67	West	0.57	0.07	0.47	0.68		32	4	26	38	0.00
		JCL	0.00	0.01	0.00	0.02		0	0	0	1	0.00
		SusYen	0.07	0.03	0.02	0.13		4	2	1	7	0.00
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		Kenai	0.29	0.06	0.20	0.39		16	3	11	22	0.02
		Kasilof	0.00	0.01	0.00	0.01		0	0	0	0	0.00
							$CCPUE_i$	56				
							$CCPUE_f$	2,580				
						2014						
2	n=214	Crescent	0.00	0.01	0.00	0.00		0	1	0	0	0.00
	n_{eff}=211	West	0.01	0.02	0.00	0.05		2	4	0	10	0.00
		JCL	0.00	0.01	0.00	0.02		1	1	0	4	0.00
		SusYen	0.08	0.03	0.04	0.14		15	6	7	25	0.01
		Fish	0.02	0.02	0.00	0.06		4	4	0	11	0.00
		KTNE	0.04	0.03	0.01	0.09		7	5	2	17	0.00
		Kenai	0.77	0.05	0.69	0.84		143	9	128	156	0.08
		Kasilof	0.08	0.03	0.03	0.13		15	6	6	25	0.01
							$CCPUE_i$	186				
3	n=544	Crescent	0.00	0.00	0.00	0.00		0	1	0	0	0.00
	n_{eff}=531	West	0.09	0.02	0.06	0.12		45	11	29	64	0.03
		JCL	0.01	0.01	0.00	0.03		6	5	0	16	0.00
		SusYen	0.08	0.02	0.04	0.12		41	12	23	61	0.02
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.05	0.02	0.02	0.07		24	8	12	39	0.01
		Kenai	0.68	0.04	0.62	0.74		352	18	322	382	0.20
		Kasilof	0.09	0.02	0.06	0.13		49	11	31	69	0.03
							$CCPUE_i$	518				
4	n=257	Crescent	0.00	0.00	0.00	0.00		0	1	0	0	0.00
	n_{eff}=252	West	0.13	0.03	0.09	0.18		31	7	20	43	0.02
		JCL	0.03	0.02	0.01	0.06		7	4	2	14	0.00
		SusYen	0.11	0.04	0.05	0.18		25	10	11	44	0.01
		Fish	0.00	0.00	0.00	0.00		0	1	0	0	0.00
		KTNE	0.02	0.02	0.00	0.06		5	5	0	14	0.00
		Kenai	0.64	0.05	0.56	0.72		152	11	133	170	0.09
		Kasilof	0.07	0.03	0.03	0.11		17	6	8	27	0.01
							$CCPUE_i$	237				
5	n=122	Crescent	0.00	0.00	0.00	0.00		0	0	0	0	0.00
	n_{eff}=114	West	0.46	0.06	0.35	0.56		43	6	33	53	0.02
		JCL	0.06	0.03	0.02	0.12		6	3	2	12	0.00
		SusYen	0.09	0.05	0.00	0.18		9	5	0	17	0.00
		Fish	0.00	0.00	0.00	0.00		0	0	0	0	0.00
		KTNE	0.00	0.01	0.00	0.00		0	1	0	0	0.00
		Kenai	0.38	0.06	0.28	0.49		36	6	27	46	0.02
		Kasilof	0.01	0.02	0.00	0.04		0	2	0	4	0.00
							$CCPUE_i$	95				

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Station	n; n_{eff}	Reporting Group	Stock composition Within station Proportion	SD	90% CI 5%	95%	Stock-specific CCPUE Within station	Estimate	SD	90% CI 5%	95%	Within year Proportion
						2014						
8	n=72	Crescent	0.00	0.01	0.00	0.02		0	1	0	2	0.00
	n_{eff}=71	West	0.26	0.07	0.15	0.38		16	4	10	24	0.01
		JCL	0.04	0.03	0.00	0.09		3	2	0	6	0.00
		SusYen	0.06	0.06	0.00	0.18		4	4	0	12	0.00
		Fish	0.00	0.01	0.00	0.01		0	0	0	1	0.00
		KTNE	0.04	0.03	0.00	0.09		2	2	0	6	0.00
		Kenai	0.59	0.09	0.44	0.72		38	5	28	46	0.02
		Kasilof	0.01	0.02	0.00	0.04		0	1	0	3	0.00
							$CCPUE_i$	64				
9	n=423	Crescent	0.00	0.00	0.00	0.01		0	1	0	2	0.00
	n_{eff}=420	West	0.17	0.02	0.13	0.21		60	9	46	75	0.03
		JCL	0.02	0.01	0.01	0.04		9	4	3	16	0.00
		SusYen	0.14	0.03	0.09	0.19		49	11	32	67	0.03
		Fish	0.00	0.00	0.00	0.00		0	1	0	1	0.00
		KTNE	0.02	0.01	0.01	0.04		7	3	3	13	0.00
		Kenai	0.59	0.04	0.52	0.64		211	13	189	233	0.12
		Kasilof	0.07	0.02	0.04	0.10		24	7	13	37	0.01
							$CCPUE_i$	361				
10	n=233	Crescent	0.00	0.00	0.00	0.01		0	1	0	1	0.00
	n_{eff}=230	West	0.10	0.03	0.06	0.15		21	6	12	31	0.01
		JCL	0.05	0.02	0.02	0.08		10	4	4	16	0.01
		SusYen	0.13	0.04	0.06	0.20		26	9	13	41	0.01
		Fish	0.03	0.02	0.00	0.06		5	3	0	12	0.00
		KTNE	0.01	0.01	0.00	0.03		1	3	0	7	0.00
		Kenai	0.57	0.05	0.49	0.66		117	11	100	134	0.07
		Kasilof	0.12	0.03	0.07	0.17		24	7	13	36	0.01
							$CCPUE_i$	204				
11	n=135	Crescent	0.00	0.01	0.00	0.02		0	1	0	3	0.00
	n_{eff}=134	West	0.01	0.02	0.00	0.05		1	2	0	6	0.00
		JCL	0.01	0.02	0.00	0.05		1	2	0	6	0.00
		SusYen	0.06	0.07	0.00	0.21		7	9	0	25	0.00
		Fish	0.00	0.00	0.00	0.01		0	0	0	1	0.00
		KTNE	0.03	0.02	0.01	0.06		3	2	1	7	0.00
		Kenai	0.69	0.08	0.55	0.81		80	9	64	93	0.04
		Kasilof	0.19	0.05	0.12	0.27		22	5	14	31	0.01
							$CCPUE_i$	116				
							$CCPUE_f$	1,782				

Note: Effective sample size (n_{eff}) is the number of samples successfully screened from each stratum after excluding individuals with <80% of all markers that could be scored. Proportions for a given mixture may not sum to 1 due to rounding error. The 90% Credibility intervals may not include the point estimate for the very low CCPUE estimates because fewer than 5% of iterations had values above zero. Stock-specific CCPUE is derived using non-interpolated CCPUE values.

[a] Stock composition estimates for 2013 underwent a major revision from data originally published in Dupuis et al. (2015).